THE FUTURE OF ARMOR IN AN ANTI-ACCESS AREA DENIAL ENVIRONMENT

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MASTER OF MILITARY ART AND SCIENCE
General Studies

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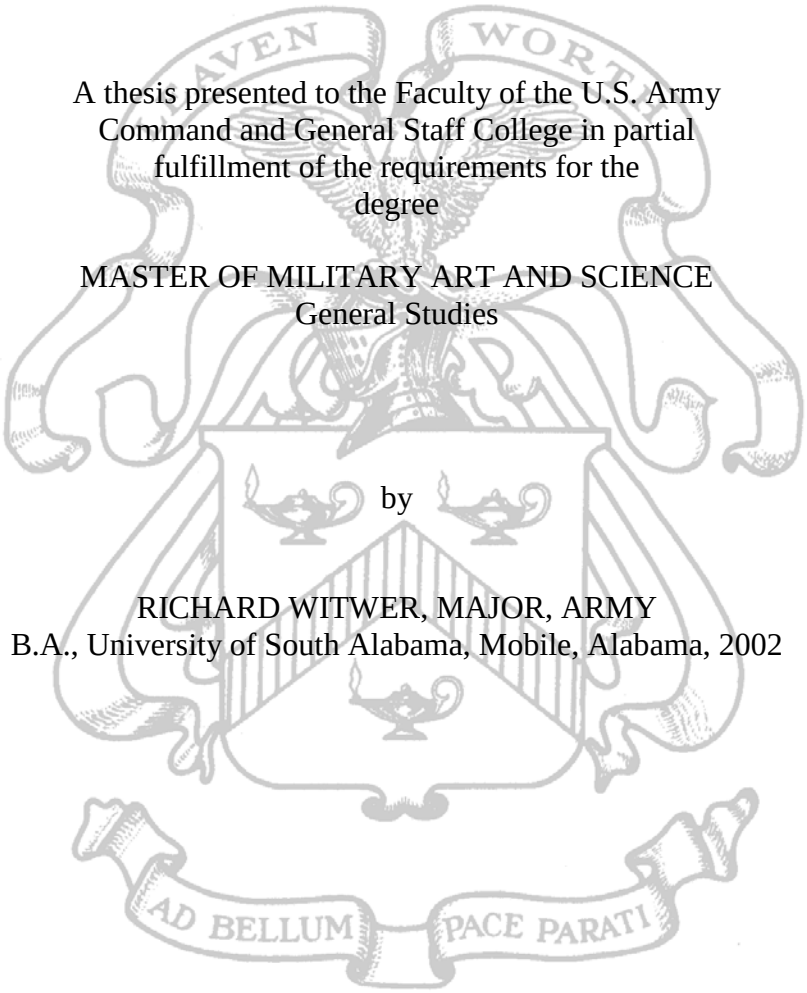
RICHARD WITWER, MAJOR, ARMY
B.A., University of South Alabama, Mobile, Alabama, 2002



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What will be the form and function of the armored force in 2030? The purpose of this thesis was to assess the possible roles and changes to the organization of the United States main battle tank and its supporting organizations. The question was examined first within the context of the United States national strategy. Potential competitors of the United States are utilizing weapon systems that deny U.S. Armed Forces access to competitor territory and to the global commons, therefore the research delved into the current Anti-Access and Area Denial weapon platforms and strategies that the United States could face in a conflict. The history of the tank was examined to provide historical context to proposed recommendations.

The research used a qualitative method that incorporated grounded theory for analysis as well as case study methodology in data collection. The current joint capabilities integration and development systems manual (2012) helped identify the categories to show potential gaps in each category. The categories used were doctrine, organization, training, materiel, leadership, personnel and facilities (DOTMLPF). The end results were general recommendations for changes to the United States main battle tank as well as recommendations within each of the DOTMLPF categories.

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THESIS APPROVAL PAGE

Name of Candidate: Major Richard E. Witwer

Thesis Title: The Future of Armor in an Anti-Access Area Denial Environment

Approved by:

_____, Thesis Committee Chair
LTC Chad Callis, M.A.

_____, Member
Jonathan M. House, Ph.D.

_____, Member
LTC Jacob C. Swantkowski, M.A.

_____, Member
LTC Joel W. Miller, B.S.

Accepted this 13th day of June 2014 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

ABSTRACT

THE FUTURE OF ARMOR IN AN ANTI-ACCESS AREA DENIAL ENVIRONMENT, by MAJ Richard E. Witwer, 91 pages.

What will be the form and function of the armored force in 2030? The purpose of this thesis was to assess the possible roles and changes to the organization of the United States main battle tank and its supporting organizations. The question was examined first within the context of the United States national strategy. Potential competitors of the United States are utilizing weapon systems that deny U.S. Armed Forces access to competitor territory and to the global commons, therefore the research delved into the current Anti-Access and Area Denial weapon platforms and strategies that the United States could face in a conflict. The history of the tank was examined to provide historical context to proposed recommendations.

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ACRONYMS

A2/AD	Anti-Access and Area Denial
ABCT	Armored Brigade Combat Team
AT	Anti-Tank
ATGM	Anti-Tank Guided Missile
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities
FSC	Forward Support Company
JOAC	Joint Operational Access Concept
NMS	National Military Strategy
NSS	National Security Strategy
PLA	People's Liberation Army
QDR	Quadrennial Defense Review
SAM	Surface to Air Missile

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CHAPTER 1

INTRODUCTION

Overview

> And the Lord was with Judah, and then he took possession of the hill country, but he could not drive out the inhabitants of the plain because they had chariots of iron.
>
> — The book of Judges 1:19 English standard version

Background

The future usefulness of armor has been a hotly debated topic since the inception of the very first tanks in the early dawn of the 20th century. The debate is still hotly raging across the many facets of the defense spectrum. Everyone has an opinion on the utility of armor in future combat environments and is happy to share that thought in any venue that presents itself, from papers, and monographs, to blogs and posted web comments.[1]

Making matters even more convoluted is the rise of the hybrid threat to challenge the roles that have been traditionally occupied by nation states. Recent examples such as the 2006 Israeli-Hezbollah conflict and the counter-insurgent wars in Iraq and Afghanistan have done little to quiet the debate.[2]

The United States Department of Defense has always tried to predict the future threat and prepare its armed forces for it. Documents created to help guide strategy are

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[1]John Stone, *The Tank Debate: Armor and the Anglo-American Military Tradition* (Amsterdam: Harwood Academic Publishers, 2000), 215.

[2]Anthony H. Cordesman, with George Sullivan, and William D. Sullivan, *Lessons of the 2006 Israeli-Hezbollah War* (Washington, DC: The CSIS Press, 2007).

the *National Military Strategy* (*NMS*), the *Quadrennial Defense Review* (*QDR*) and the Chairman of the Joint Chief's strategic direction to the joint force. These documents have provided strategic focus to the United States Military, but have not answered the arguments of how the United States armored force will be utilized when faced with the future enemy. The authors of the AirSea Battle concept intend that concept to be the future United States' response to Anti-Access and Area Denial (A2/AD). The United States has started to shift its focus to the Pacific region as the war in Afghanistan comes to a close. Taken at face value, this strategic concept does not directly address the utilization of armor in the A2/AD strategy. If the Armor Branch is to remain relevant it must understand its role in A2/AD, and how both will fit under the Unified Land Operations.[3]

Fitting into the national strategy is extremely important, but it is just the first step in understanding the future form and function of armor. The United States has been facing budgetary crises since 2008. Armor is an expensive branch to maintain due to the equipment, maintenance and logistics needed for training and operations. The armor community should consider ways to maximize every dollar. The armor branch may not be able to maintain technological or operational relevance due to the necessity to balance the United States budget, and not because of external threat from a potential enemy, either imagined or real.

[3]Air-Sea Battle Office, "Service Collaboration to Address Anti-Access and Area Denial Challenges," Unclassified summary, 2013, http://www.defense.gov/pubs/ASB-ConceptImplementation-Summary-May-2013.pdf (accessed 15 January 2014).

Primary Research Question

What will be the form and function of the armored force in 2030?

Secondary Research Questions

In answering the primary research question, it will become necessary to discuss, and answer some secondary research questions. In regarding the function of armor, we must first answer specific questions about the form and function of armor. First, how does armor contribute to AirSea Battle, especially within the concept of A2/AD? Second, is the organizational structure of the Armored Brigade Combat Team (ABCT) an effective organization to answer future hybrid threats? This paper will also address, in two parts, budgetary problems related to the employment of tanks. First, how can armor retain maneuverability and firepower at a reduced cost? Second, how can we reduce the logistical need or create logistical efficiency in utilizing armor? In answering all of the previous questions, we will look at a final question. What are the historical lessons on the use of armor/cavalry that can be applied today?

Assumptions

The debate on whether an armored force is relevant, especially with the invention of Anti-Tank (AT) guided munitions and laser guided missiles that can be fired from afar, will continue to rage for many years to come. An in-depth study on the relevance of armor in and of itself could be a thesis. In order to limit the scope and length of the paper, this study will assume that armor is indeed relevant and will remain relevant for the next 50 years. It will also assume that the United States will continue to fund the Department

of Defense at levels sufficient to maintain a relevant and deployable armored force, but the study will still address how to utilize tanks in as an efficient means as possible.

Definitions

This study will have many terms that will need definition to make sure that all who read will have a common base of understanding. I will define (1) armor, (2) tanks, (3) armor branch, (4) Unified Land Operations, (5) Decisive Action, (6) hybrid threat, (7) operational environment, (8) assured access, (9) global commons, and (10) anti-access and area denial (used as A2/AD hereafter).

The future use of "armor" and "tank" will be terms used synonymously and interchangeably to mean the M1A2 (and variants) main battle tank used in the United States military.

Anti-Access and Area Denial: Coordinated operations by an adversary's air force and integrated air defenses to achieve a degree of air parity or local air superiority over its territory. Land based operations might include short to medium range artillery, rockets or missiles at either littoral penetration points, or forward staging bases. Enemy forces can be used against maritime forces to include anti-ship cruise missiles, ballistic missiles and submarines.[4]

Armor Branch: A group of members that encompasses armor or combined arms organizations that close with and destroy the enemy using fire, maneuver and shock

[4]Andrew F. Krepinevich, *Why AirSea Battle?* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), 10.

effect; as well as cavalry organizations that perform reconnaissance and security roles through decisive action.[5]

Armor/Tank: Merriam-Webster's dictionary defines tank as a heavily armed and armored combat vehicle that moves on two continuous metal chains called tracks. It goes on to state that it is normally equipped with a cannon and automatic machine guns normally on a revolving turret.[6] The actual name tank is reported to have been due to the British military wanting to have a designation which would not divulge its nature, but yet would satisfy the curiosity of anyone that would see the form under a tarpaulin on the railway car. After some discussion, the British chose the term tank—meaning a water tank—while rejecting the terms cistern and container.[7]

Assured Access: The unhindered national use of the global commons and select sovereign territory, waters, airspace and cyberspace, achieved by projecting all elements of national power.[8]

Decisive Action: The Army conducts decisive and sustainable operations through the simultaneous combination of offensive, defensive, and stability operations appropriate to the mission and the environment.[9]

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[5]Headquarters, Department of the Army, Army Doctrine Publication Pamphlet 600-3, *Commissioned Officer Professional Development and Career Management Concept* (Washington, DC: Government Printing Office, February 2010), 66.

[6]Merriam-Webster, "Armor/Tank," 2004, http://www.merriam-webster.com/dictionary/tank?show=0&t=1399305632 (accessed 5 April 2014).

[7]Hugh Cuthbert Basset Rogers, *Tanks in Battle*, vol. 8 (London: Seeley, Service, 1965), 42.

[8]Department of Defense, *Joint Operational Access Concept* (Washington, DC: Government Printing Office, January 2012), 40.

Global Commons: Areas of air, sea, space and cyberspace that belongs to no one state. It is vital that the United States retains access for its own national interests, both as an end in itself, as well as projecting military force into hostile territory.[10]

Hybrid Threat: Hybrid threat components are two or more of the following:

1. Military forces
2. Nation-state paramilitary forces (such as internal security forces, police or border guards)
3. Insurgent organizations (movements that primarily rely on subversion and violence to change the status quo)
4. Guerrilla units (irregular indigenous forces operation in occupied territory)
5. Criminal organizations (such as gangs, drug cartels or hackers).

Hybrid threats use the before mentioned capabilities to force any intervening power to adjust its plans and operations. All components of the hybrid threat will also use cyber operations against the intervening power in an effort to degrade command and control or to conduct information operations.[11]

Operational Environments: Any area in which United States' forces might find themselves conducting operations. It is further defined as a composite of the conditions,

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[9]Ibid., 5.

[10]Ibid., 42.

[11]Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations* (Fort Monroe, VA: Government Printing Office, May 2012), 5.

circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander.[12]

Unified Land Operations: A warfighting doctrine that describes how the Army seizes, retains and exploits the initiative to gain and maintain a position of relative advantage in sustained land operations through the use of decisive action. This doctrine is the Army's contribution to the joint fight and is meant to prevent or deter conflict, prevail in war and create the conditions for favorable conflict resolution.[13]

Another definition included in the *Joint Operational Access Concept* (*JOAC*) of 2012 is that anti-access is those capabilities that are normally long range, designed to prevent an advancing enemy from entering an operational area. Area denial is defined as capabilities, normally shorter in range, designed to limit the freedom of action within an operational area.[14]

Relevance of the Study

The United States has shifted its national strategy to the Asia-Pacific region. The *JOAC* 2012 has focused the joint community on A2/AD, among other priorities. It would be easy to see a conspicuous absence in any mention of the armored force. This study will address how the United States Army can utilize its armored power in conjunction with or as an integrated part of the AirSea Battle concept, especially in area denial, in a decisive yet fiscally responsible manner. Even though the contribution of tanks to A2/AD

[12]Ibid., 12.

[13]Headquarters, Department of the Army, Army Doctrine Publication 3-0, *Unified Land Operations* (Washington, DC: Government Printing Office, October 2011), 1.

[14]Department of Defense, *Joint Operational Access Concept*, 40.

is only in area denial, this paper used the entire term A2/AD for simplicity's sale. The in-depth understanding of the role of tanks in the national military strategy's application of the A2/AD operational concept will play an important part in maintaining the armored force as a critical component of the Army for the near future.

Scope

This study limits itself to addressing the form and functions of the United States Armor force facing potential threats in 2030. To help assist in focusing the reader, there will be examples of Russian, Chinese and Hezbollah operations and tactics in A2/AD. This is to provide context and examples only, because the equipment being used by those groups is widely distributed around the world. Congressional Budget Office information will also be used, as well as the Department of Defense budget, to assist in understanding the budgetary issues that the Army has in employing armor around the world in a future conflict. This study will end with recommendations concerning the role and organization of the armored force, general recommendations of broad equipment concepts to be added to the tanks, as well as recommendations in logistical employment to help ease the fiscal footprint.

Delimitations

What are not considered in this study are specific tactical standard operating procedures or tactics techniques and procedures to be used by individual ABCTs. This study will not discuss specific technologies or pieces of equipment to upgrade on the armor platform. It will also not discuss whether armor is relevant to the future, but will make the assumption that it will be.

Conclusion

This study has five chapters. The first chapter focused on the background of the problem and discusses what the thesis is to be researched. It also showed what was and was not utilized in this research to provide focus. Chapter 2 is the literature review, and used current doctrine, published national strategy, the AirSea Battle concept as well as published works that are relevant to the research on A2/AD. Chapter 3 discusses the research methodology. Chapter 4 analyzes the information presented on views from multiple thoughts of the employment of armor in A2/AD and arguments along logistic and budgetary threads from both sides. Chapter 5 presents the study's conclusions, offered recommendations as well as discussed what potential future research can be done. It is important to note that even though some of the topics researched have a classified component, this study will only discuss unclassified information.

CHAPTER 2

LITERATURE REVIEW

> It was only in the desert that the principles of armored warfare [sic] could be fully applied and thoroughly developed. It was only in the desert that real tank battles were fought by large-scale formations.
>
> — Erwin Rommel, *Kreig ohne Hass*

AirSea Battle

AirSea Battle is an attack in depth concept over five domains (air, land, sea, space and cyberspace) to create an advantage. It gives strategic advice on both offense and defense across these five domains. The primary focus for this study will be on the section called A2/AD. Armor is limited in its usefulness to Area-Denial, or actions that are to hinder friendly operations already within the theater. The use of cruise, ballistic, and other types of missiles is the predominant threat to armor, providing the enemy an easy-to-equip and highly maneuverable system to combat our forces. There are four assumptions that are the crux of A2/AD. First is that an attack by a potential adversary can be without warning. Second, friendly forces will be instantly in the A2/AD environment once hostilities start. Thirdly, any potential adversary will be able to attack U.S. and allied supporting operations. Fourth, all five domains will be contested by future adversaries. Lastly, the U.S. cannot afford to completely cede any domain to the enemy.[15]

Anti-Access and Area Denial is designed to be a counterbalance to the US recent historical dominance in the sea, cyber, space and air domains which allow us to build land forces in relative safety. China and the People's Liberation Army (PLA) are building

[15]Air-Sea Battle Office.

up capabilities that are focused on an A2/AD strategy. This will force the United States into a strategic choice of either finding ways to overcome A2/AD or paying an ever-increasing cost for sustained military access.[16] For US peer competitors the acquisition of a significant number of extended range fire systems such as ballistic and cruise missiles will challenge the concept of a base or safe haven to build up US Armed Forces strength. More and more these bases will become a source of anxiety encouraging one side or both sides into pre-emptive strikes.[17]

Dependence on a safe haven was noted by the comments of a retired Indian brigadier general based on his observations immediately following the First Gulf War. Access to forward bases is the trickiest operational problem faced by America and is the proverbial "Achilles heel."[18] Land based A2/AD operations will include short to medium range artillery, rocketry and missile strikes. These capabilities will likely be focused on countering long range airborne strikes with increasing number of Surface to Air Missiles (SAMs). The PLA will use an integrated air defense to protect vulnerable command and control nodes, ballistic and cruise missile sites. The PLA has an indigenous HQ-9 and Russian SA-10 as well as SA-20 PMU1/PMU2 which can attack aircraft as well as cruise missiles. China continues to improve its SAM capability by pursuing the acquisition of the Russian S-400 SAM system that can target out to 400 km. The PLA will also

[16]Krepinevich, *Why AirSea Battle*, 2.

[17]Ibid., 8.

[18]Ibid., 9.

continue to research and develop its own HQ-9 for ranges out to 200km.[19] New air defense equipment acquired by the PLA includes the first medium range CSA-16 and a new advanced self-propelled air defense artillery system called the PGZ-07.[20]

The PLA has a strike capability that is growing, and is the basis of the A2/AD strategy. The PLA Second Artillery Corps has in its inventory more than 1,100 short range ballistic missiles as well as conventionally armed medium range missiles including the DF-21D anti-ship ballistic missile. This is a variant of the DF-21 medium-range ballistic missile that gives the PLA the capacity to attack large ships, including air-craft carriers. The DF-21D has a range of over 1,500km and is armed with a maneuverable warhead.[21]

The reader can see the effective ranges of these conventional and ballistic missile strike capabilities in the next two figures. Of note is how this covers the first and second island chains where the US has significant forward staging, as well as the range and capability to strike sea lines of communications and any target chosen within the United States itself.

[19]Department of Defense, Annual Report to Congress *Military and Security Developments Involving the People's Republic of China 2013* (Washington, DC: Office of the Secretary of Defense, 2013), 35.

[20]Ibid., 9.

[21]Ibid., 5-6.

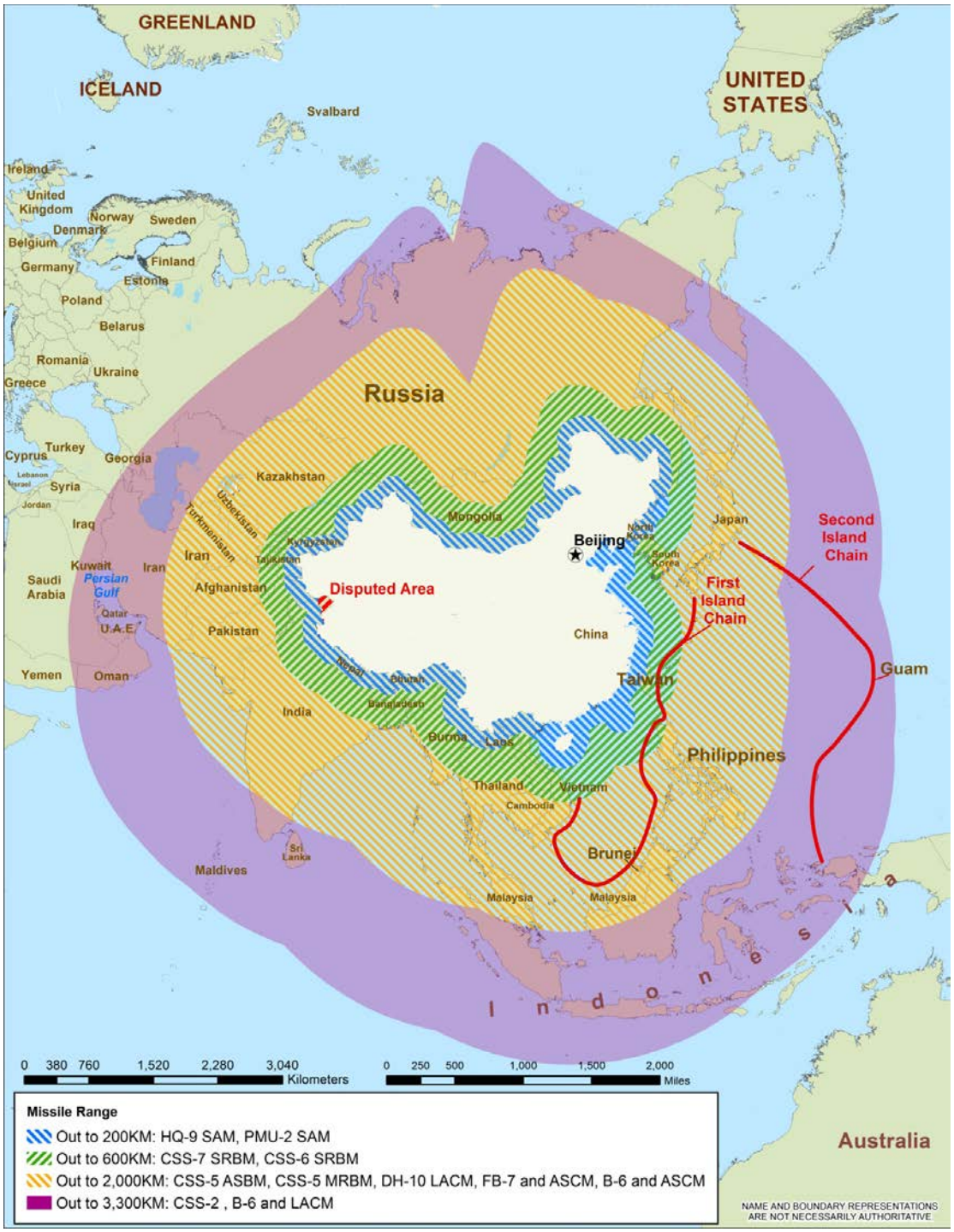

Figure 1. Chinese Conventional Strike Capabilities

Source: Department of Defense, Annual Report to Congress, *Military and Security Developments Involving the People's Republic of China 2013* (Washington, DC: Office of the Secretary of Defense, 2013).

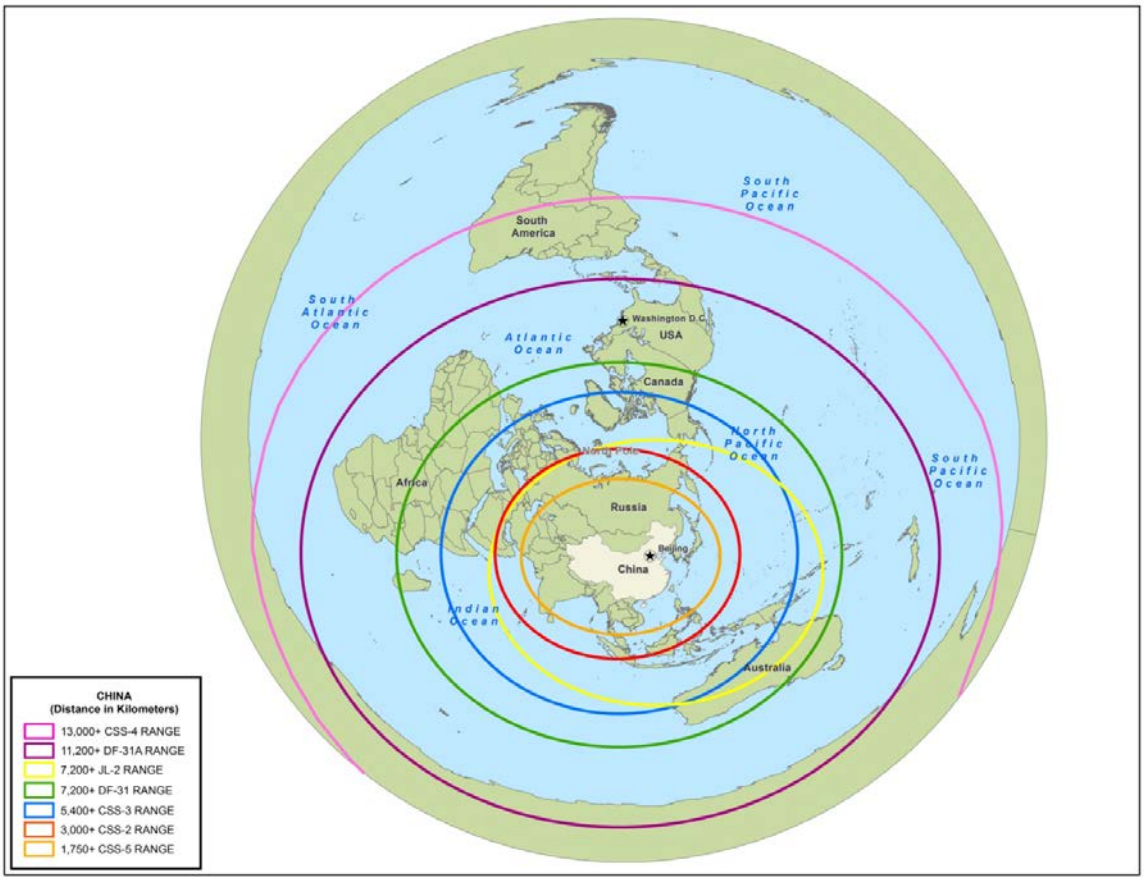

Figure 2. Medium and Intercontinental Range Ballistic Missiles Capabilities

Source: Department of Defense, Annual Report to Congress, *Military and Security Developments Involving the People's Republic of China 2013* (Washington, DC: Office of the Secretary of Defense, 2013).

The Chinese have also developed an additional piece to threaten the US sea lines of communication with tier submarine forces. China currently has three JIN-Class SSBN that carry the JL-2 ballistic missile with a range of 4,000nm. The development of the SHANG-Class SSN and the Type 095 guided missile attack submarine will threaten both and land and sea-based logistics as well as aircraft carriers.[22] It is evident that the PLA

[22]Ibid., 6-7.

has a growing A2/AD capability that will soon, if not currently, challenge the United States' assured access to the global commons. While the focus of this paper is not on the whole of government approach to this problem, it is important to show potential A2/AD capabilities that exist before we discuss the possible role armor has to play in defeating A2/AD capabilities.

Review of Relevant Strategic and Doctrinal Publications

The *JOAC* discusses how the joint force will achieve operational access against an enemy determined to deny access as part of an overarching whole of government approach. *JOAC* is part of the joint forces to guarantee the access of the global commons, as well as assured access to any area that is integral to the national interests of the United States.[23] Operational access is the overarching whole of government approach that has nested within it the joint force concept to fight A2/AD techniques. *JOAC* spends the first five pages defining key concepts such as operational access, assured access, and global commons. These can be briefly summarized to mean the projection of military force with sufficient freedom, unhindered access into global commons, and areas of air, sea, space and cyberspace that belong to no state, respectively.[24] A2/AD is further defined as the enemy first trying to deny access utilizing long range means, then finally trying to restrict access already gained by short to medium range means. *JOAC* extrapolates that geography, specifically distance, is the biggest challenge to the U.S. and is the largest

[23]Department of Defense, *Joint Operational Access Concept*, i.

[24]Ibid., 1-5.

contributing factor to A2/AD problems. Distance can be overcome by forward staging bases, but these come with their own set of logistical, protection and political problems.[25]

There are specific enemy capabilities listed to use A2/AD, but there are capabilities that pose specific threats against armored forces. Precision-guided rockets, artillery, missiles, mortars, chemical and biological attacks, mines, unmanned systems, special operations forces and enemy land maneuver forces all are A2/AD problems that tanks must deal with in order to assure operational access in a joint environment.[26]

The *JOAC* concept to defeat A2/AD methods is based on gaining and maintaining dominance in as many domains as possible, including the emerging domains of space and cyberspace. This concept *JOAC* labels as cross-domain synergy, and argues that it will provide the freedom of action to forces that will allow mission accomplishment. A key component of *JOAC* is operational access precepts. These are well thought out fundamentals that can be applied to a variety of situations to enable cross-domain synergy at the lowest levels possible. While there are 11 possible precepts to choose from or use in any combination, there are some of these key areas that can be utilize easily by armored forces. Armor can exploit advantages in the land domain to disrupt enemy A2/AD capabilities in other domains, as well as attacking these capabilities in depth as part of joint cross domain synergic operations. Armor has long had the advantage in disrupting enemy reconnaissance while protecting our own. Armor, with the advantage in mobility, and using operational deception to maneuver against operational objectives that can disrupt or destroy A2/AD capabilities in either the land domain, air domain,

[25]Ibid., 8.

[26]Ibid., 10.

cyberspace or others by targeting IADS, airports and communication nodes respectively as an example.[27]

The *JOAC* describes how the different war fighting functions fit within the operational access concept, and recommends capabilities via tasks to be used or augmented in this approach. These tasks are almost too broad to be overly useful, but could act as a guide for future acquisitions in systems that will enable these tasks to be performed. *JOAC* concludes with a listing of risks if this concept is adopted into the joint community. To boil down some of the most common themes, the initial major risks are that the joint community does not act in a joint manner to achieve synergy or dominate enough domains to force access into areas that are being denied by a determined enemy. The last series of risks primarily deals with the joint access concept being misunderstood and misapplied, either by commanders and staff or those outside of the military but have an acquisition, appropriation and apportionment roles that can affect the *JOAC* negatively.[28]

The *National Security Strategy* (*NSS*) of May 2010 was written in a different time, even though it was only four years ago. It is important to remember that there were two wars still ongoing; in Iraq and the war in Afghanistan. With this in mind, the *NSS* may not be as applicable today, but there are still items to be gleaned.

While the security of the United States remains the top priority the *NSS* recognizes the need for cooperation with our friends and allies. The basis of these relations deals with our prosperity, values and the security we can provide. The *NSS*

[27]Ibid., 17.

[28]Ibid., 36-38.

asserts that our superior capabilities deter and defeat adaptive enemies and ensure our credibility to our security partnerships. It remains the role of the Army, by in large, to provide that security, and without a strong military, we will lose our technological edge and decrease our allies confidence in our strategic partnerships.[29]

The rest of the security portion of the *NSS* focuses on violent extremists and their affiliates and how to disrupt, dismantle and defeat them while advancing peace and opportunity in the greater Middle East. The *NSS* maintains the right of the United States to act unilaterally to defend our nation and our interest, within international standards, working with institutions such as North Atlantic Treaty Organization and the U.N. Security Council if possible. The *NSS* asserts that the US will always take care of our men and women in uniform to make sure they have the leadership, training and equipment required to accomplish the mission.[30]

While the chapter on prosperity does not specifically mention the military, it is important to note that a prosperous nation will have the capital to invest in the military for training and research of new technologies. The *NSS* guides this through the plan to enhance education, emphasizing science and technology as well as encouraging the economy to have a balanced and sustainable growth.[31] The chapter on international order sheds continued light on the emphasis of building partnerships and strong alliances. Currently the Russian crisis places more emphasis on what was written in the *NSS* on

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[29]The White House, *National Security Strategy* (Washington, DC: The White House, 2010), http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf (accessed 21 December 2014), 18.

[30]Ibid., 22.

[31]Ibid., 28-31.

engaging our allies bilaterally as well as utilizing the North Atlantic Treaty Organization to deter and prevent hostilities. The Army and armored force has a role in conducting this deterrence. The pivot to Asia also provides opportunities with Japan, South Korea, Australia, the Philippines and Thailand to be the bedrock of prosperity and security in the region.[32] Conspicuously absent is the mention of China in anything other than an opportunity to build cooperation.[33] The *NSS* is really about facilitating cooperation, strengthening alliances and building partner capacity with nations that share our values and our interests.

The *NMS*, 2011 gives more insight in the challenges that face the United States. It is also the first time we see mention of A2AD in a national strategic document. While the *NMS* does talk about weapons of mass destruction and concerns of proliferation, it spends longer talking about global commons and connected domains. The *NMS* stresses the need for the United States to maintain assured access to all regions shared by sea, air and space, and prevent these domains from being exploited by non-state actors, hybrid threats and states developing A2/AD capabilities.[34]

The *NSS* establishes four National Military Objectives that it states are derived from the *NSS* and the *QDR*. These are to counter violent extremism, defeat and deter aggression, strengthen international and regional security and shape the future force.[35]

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[32]Ibid., 40-42.

[33]Ibid., 43.

[34]Department of Defense, *National Military Strategy of the United States of America* (Washington, DC: Government Printing Office, 2011), http://www.army.mil/info/references/docs/NMS%20FEB%202011.pdf (accessed 1 January 2014), 3.

[35]Ibid., 4.

While the first three have been mentioned previously, the fourth is important to our discussion. In the capabilities and readiness section of the *NMS*, the focus is on the Joint Land Forces being capable of full spectrum operations, and to be organized to provide a versatile mix of tailor able and networked organizations operating on a sustainable rotational cycle. The *NSS* continues by talking about short term efforts to increase forward presence and engagement, stating that this will take a greater importance as well as developing essential capabilities and capacity to outpace emerging threats.[36]

The *NMS* focused on taking guidance from the other strategic documents in putting them in focus for the military. It is of interest to note that this is the first mention of A2/AD and it will be a continuing trend that we will see in the future.

Sustaining U.S. Global Leadership: Priorities for 21st Century Defense January 2012 is a document that refocuses the primary mission of the U.S. Armed Forces on ten key concepts, some of which reiterate previous national documents while others bring new concerns to the fore. There is a continued focus on violent extremist groups resulting in missions that deal with counter terrorism and irregular warfare. Deter and defeat aggression is an ongoing theme that has been already discussed. Projecting power, despite A2/AD challenges, is bringing to the fore front what was discussed in the *NMS*. It is interesting that the concern about A2/AD is now so prevalent that it has been elevated from being mentioned in the *NMS* to one of the key missions for the armed forces. It goes

[36]Ibid., 19, 20.

on to state that the United States will invest as required to ensure its ability to operate effectively in A2/AD environments.[37]

Further missions were not new but included recurring themes of countering and deterring the spread of weapons of mass destruction, operating in cyberspace and defending the homeland while providing for a stabilizing presence by conducting stability and counterinsurgency operations. The document also makes mention of the need for the Joint Force to conduct humanitarian assistance and disaster relief. These missions will be facilitated by eight principles, which represent the "ways" of a policy. The first principle is to determine which mission is applicable to what international problem. The second is to prioritize investments, simply because the government cannot invest in every developing technology during a time of austerity. Third, is to maintain a ready and capable force, while still reducing the overall capacity. Fourth, is to reduce overhead in the Department of Defense. Fifth, is to examine existing programs to see if they align with the national strategy. Sixth, is to re-align the ratios between the active and reserve components. The seventh is to build networking ability through the Department of Defense as well as the Joint Force. Finally, is the need for strategy to be adjusted for the shrinking budget while still maintaining an adept industrial base and investments in science and technology?[38]

All-in-all the document, *Sustaining U.S. Global Leadership,* was meant to be a mid-course adjustment to the huge ship that is the Department of Defense, focusing it on

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[37]Department of Defense, *Sustaining U.S. Global Leadership: Priorities for the 21st Century Defense* (Washington, DC: Government Printing Office, January 2012), 4-5.

[38]Ibid., 6-8.

missions, some old and some new. It is the elevation of A2/AD and the continued impact of the budget that is the takeaway for this thesis.

The new *QDR* of 2014 has a lot to say about sequestration, budgets and rebalancing the force. This research focuses on where the *QDR* mentions future security challenges as it applies to A2/AD and its reverence to the armored force. In the *QDR*'s very first chapter, the pivot to Asia-Pacific is central to our assured access to the global commerce via the global commons. This is especially important in the light of China's rapid military growth with relative lack of transparency.[39] Critical to note is the *QDR*'s reference to the growing threat including countries such as China poses as they seek to counter U.S. strengths using A2/AD approaches along with cyber and space technologies. Especially the development of integrated air defense along with the growing number and technological advancement of conventional ballistic and cruise missile technology.[40]

The *QDR* talks about the defense strategy. The importance of deterrence using military means, potentially utilizing armor, is important to note. One of the pillars to the defense strategy is to project power and win decisively. While the projection of power is normally the domain of the Navy and Air Force, the threat of power projection diminishes without the capability, via ground forces, by improving the capability to defeat A2/AD systems in the face of large-scale, coordinated attacks. This is especially true in the face of aggression by nations such as North Korea.[41]

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[39]Department of Defense, *Quadrennial Defense Review Report* (Washington, DC: Government Printing Office, 2010), http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf (accessed 1 April 2014), 4.

[40]Ibid., 6-7.

[41]Ibid., 20.

The *QDR* changes its focus for the rest of the report on the impacts of the tight budget constraints. The *QDR* mentions that the ground force, specifically the Army, needs to be capable of conducting prompt and sustained combat as part of large-scale, multi-phase joint and multilateral operations. This is difficult to do as the rest of the *QDR* spells out the impacts of the $487 Billion cuts by the Budget Control Act. The Army, especially the Armor branch, will need to figure out how to maximize effect while minimizing cost. Specifically, the armored force needs to nest within the *QDR*'s intent when it mentions that it must retain the ability to defeat an enemy's ground forces and occupy territory. If it cannot do that in the face of A2/AD threats, the ability to deter aggression, gain access, and project power will be greatly reduced. Conducting a Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities (DOTMLPF) analysis in chapter 4 of this thesis will help answer the thesis questions posed on the function of the armor in the future and will fit within the *QDR* which argues that the ground forces must refine doctrine, modernize our capabilities, and regain our proficiency to conduct forcible entry and large-scale combined arms maneuver operations.[42]

The final point to bring out, stated by General Dempsey as the Chairman of the Joint Chiefs, is that while U.S. military response to aggression begins with air or maritime forces, it typically includes and ends with commitment of forces from the ground. Organization, training and equipment of all ground forces, including armor, will be critical for these forces to meet future strategic threats. If the Armor branch is not able

[42]Ibid., 35-37.

to meet these requirements, the risks in conventional fights will be considerably elevated.[43]

Book Reviews

The Tank Debate by John Stone delves deeply into the debate on the future usefulness of armor. Dr. Stone correctly points out that claims of the near demise of tanks are not new, indeed the debate started at the inception. World War I produced experts from both sides, all espousing differences of opinion in armor utilization. The British were fond of the penny packet method, scattering tanks as mini mobile infantry support platforms.[44]

The crux of the current debate on the death of tanks is the introduction of new technologies. Equipment such as Anti-Tank Guided Missiles (ATGMs) and AT gun platforms are hailed as cheap means that make armor obsolete. These arguments tend to be short sighted, as the technologies to increase the protection of the tank platform continue to evolve with the weapons systems designed to defeat it.[45] Dr. Stone by and large rejects the reductionism argument made by those that espouse the death of tanks as a useful platform by ATGM systems. He does emphasize the difference of opinion between national views on the application of armored warfare. Dr. Stone argues that British and US views of warfare were essentially tactical and attritional pre-1970, and that this doctrinal focus predicated tanks that had a major emphasis on protection and

[43]Ibid., 61-62.

[44]Stone, *The Tank Debate*, 23.

[45]Ibid., 5, 9.

firepower, with a sacrifice in mobility. This contrasted sharply with the Soviet and Israeli maneuver based doctrine. For them, tanks were designed to penetrate enemy lines at a point of weakness and strike at valuable targets at the rear of the enemy lines in the Russian system. Losses of armor were examined from a different viewpoint than the Russian counterparts in the west. US and British thought about the main battle tank as a platform to be applied directly against front line units and in the most intense parts of the front line, contrasting the role of armor to that of the Russians.[46]

The Tank Debate went on to state that history has shown distinct advantages in the utilization of tanks when used as part of combined arms maneuver, with fires to suppress enemy infantry with AT systems, in concentrated units to punch through a single point in the front line. This allows armor to envelop enemy forces and strike at softer targets like command and control elements and logistical nodes starting with the battles with World War I and proceeding into World War II.[47] Dr. Stone uses his entire chapter two to establish the historical basis for his argument. He then use chapters 3 and 4 of his book to show that there will always be a seesaw act of firepower and protection, racing ahead and then falling behind the other. Attacking the concept of the expense of a tank being destroyed by the far less expensive ATGM, Dr. Stone examines how the AT systems are dedicated to a single role, destroying tanks. If there is no armor to target, the weapon is greatly minimized in its usefulness. The tank maintains and can accomplish multiple roles for its price, and it comes with a great deal of mobility and protection that ATGM systems do not bring. If you mount antitank weapons to another platform, an

[46]Ibid., 9.

[47]Ibid., 27.

attack helicopter for instance, you simply erase the benefit of low cost. An example would be the AH-64 costing well over twice the price or a tank, with very little armor to accompany it.[48]

Dr. Stone wraps up *The Tank Debate* by pointing out his view of the inherent weakness in western tanks. He argues that the M1 Abrams and the Challenger series tanks were designed when the West still held the attritional doctrinal views, focusing primarily on winning tactical battles. With the West's shift to maneuver theory, the before mentioned tanks are not suitable to the task at hand. Dr. Stone compares US tanks with their Russian counterparts, to show that there is a distinct lack of trafficability, defining trafficability as the potential for the particular vehicle to utilize different road conditions as well as cross bridges of lower classification.[49] Stone uses the issues of poor operational mobility and the large logistical needs of the Abrams main battle tank as the real issue facing the US armor community. His conclusion is that, given the US doctrinal shift to maneuver theory warfare that the Abrams is not built or suited for; economic and political pressure will commit few resources to build a completely new platform more suited to the role in the next 10 to 20 years. Stone's estimation is that the divide between doctrine the tank capability are much bigger factors in the relegation of armor to background roles, then AT weapons will ever do.[50]

Tanks and Armor in modern warfare by James Cary is a look at the development and utilization of tanks in warfare from World War I through World War II and

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[48]Stone, *The Tank Debate,* 100.

[49]Ibid., 141

[50]Ibid., 157.

concluded by asking some questions about the future nature of armor in war. Written almost in narrative form, *Tanks and Armor* is easy to read and digest. Nations fighting in World War I initially struggled with the very nature and purpose of the tank. showed that the most successful utilization of tanks in World War I was during times when armor was massed together, rather than dispersed, used to trample wire and obstacles for the infantry and attack in depth while the infantry closed the gaps and destroyed units displaced by the tank attack.[51]

The lessons that the British learned in Cambrai in the concentrated use of tanks were adapted by the Germans in 1918 with their last great offensive of the war. The Amiens sector assault by the Germans almost ended the war if it had not been, in part, for the counter offensive spearheaded by armor to reform the line near Villers-Brettoneux. This engagement also happened to bring the first tank versus tank fight in history between German A7V and a British Mark IV, ending with tanks destroyed on both sides and the German tanks withdrawing.[52]

The lessons of tank warfare in World War I culminated with J.F.C. Fuller's plan 1919 where he proposed to mass up to10 thousand tanks that would attack through weak points in the German line and destroy key communication and command nodes. This breakthrough would be followed up and eventually exploited by the infantry. Plan 1919

[51]James Cary, *Tanks and Armor in Modern Warfare* (New York: F. Watts, 1966), 25.

[52]Ibid., 67.

never happened due to the German national collapse, which may have accounted for the tepid review of tanks by allied forces high commands.[53]

James Cary continues his review of tank warfare with World War II. Cary starts directly with the western front, skipping almost any discussion of the invasion and capitulation of Poland, Denmark and Norway. There was nothing new discussed about the invasion of France that is already known, with some emphasis put on the location of panzer divisions as well as Allied tank divisions. Cary takes a pause in his narrative to discuss how the German army went from a defeated nation to fielding armor units that could defeat the French in such a quick fashion. Here, the author states that the German General Staff established a committee to study tank warfare that was not hindered by the physical limitations of tanks that already existed in the national arsenal, as German was not allowed to have tanks.[54]

German commanders came to the conclusion that Germany would never win a long war of attrition and therefore needed quick and decisive operational action. Armor provided the platform to accomplish this. Studies concluded that the tank's effectiveness can be greatly enhanced if it is used en masse on a limited front with ample infantry reserves that were trained to work with tanks and by focusing fires against stubborn strong points. Essentially, tanks were best used within the construct of combined arms. The study also concluded that tanks needed quality communications, sufficient range and

[53]Ibid., 74.

[54]Ibid., 89.

mechanical dependability. The Germans produced prototypes in secret, and in 1933, the same year Hitler came to power, the German armored force started to be produced.[55]

Tanks and Armor also included four whole chapters on the African campaign of the Axis and Allied forces. While still very easy to read, and written well, it did not present anything new in the fashion of armored warfare not already discussed in other works. Cary gave descriptions of advances in tank models and equipment used in Africa, as well as divisional allocation of tank forces. The noteworthy point was the use of tanks for lighting fast, operational and tactical surprise attacks on an unsuspecting enemy. A technique employed by both the Germans and the British. Tanks were also used to encircle fortifications and heavily defended ports. Once encircled however, tanks efficiency was diminished in frontal attacks against these strongholds.[56]

Cary discussed in the next two section of his book, the Soviet and American campaigns against Germany in Europe. He made a good account of the action at the Army level, sometimes going down to the division, in James Cary's easy narrative style. He noted that tanks are vulnerable when used without fire support in the defensive[57] as well as the value of designing tanks specifically for national strategy, as the Russians did with the T-34 and KV-1.[58]

Tanks and Armor concludes with thoughts on the future of armor. Cary discussed the U.S. and West German collaboration on the main battle tank designs in the 1970s as

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[55]Ibid., 89-90.

[56]Cary, *Tanks and Armor,* 119-126.

[57]Ibid., 183.

[58]Ibid., 185.

well as the M48, M103 and M60 designs.[59] Even though dated, James Cary's work on tanks showed, through historical examples, principles in armored warfare that may have been forgotten in the quest to design tanks that are protected against any threat, attack any target and act as moving fortresses instead of a highly mobile force that strikes through along a narrow frontage against operational and tactically important targets.

Tanks in Battle by Colonel H.C.B. Rogers is also a historical look at armored warfare. There are some differences, though, between this book and *Tanks and Armor*. Rogers considered it necessary to look a little further back in history, to how heavy cavalry was used. The first chapter deals with the time frames from the Hyksos to Charlemagne, with the second chapter dealing with the rest of mounted warfare to the development of guns. Rogers argues that it was the use of chariots pulled by horses that created the decisive victories enabling the Hyksos to overthrow the Egyptians and rule for three to four hundred years. This was so devastatingly powerful that the Egyptians themselves made chariots a critical part of their own army, allowing Pharaoh Thutmose III to destroy the army of the King of Kadesh at the battle of Megiddo in 1479 B.C.[60]

Tanks in Battle discusses other nations like the Israelites, Persians, and Greeks mainly discussing the different forms of chariots these nations utilized, to great effect in certain conditions. Rogers used the battle of Erythrae in 479 B.C. to show that cavalry attacking over broken ground, against a well prepared infantry, had a detrimental effect on the cavalry. Rogers therefore made a well-founded conclusion that officers should

[59]Ibid., 254-259.

[60]Rogers, *Tanks in Battle*, 13.

keep in mind, and that is cavalry should not be used against infantry that is well prepared in defensive positions on ground of their own choosing.[61]

The advent of rifles and rapid fire weapons limited the shock capability of mounted warfare which effectively ended the era of horse cavalry on the front lines with the disastrous charges made by the French during the Franco-Prussian war of 1870.[62] Vehicular-mounted warfare did not emerge as a true threat on the battlefield until World War I. The need to break the stalemate of trench warfare created the necessity, and was developed, reluctantly at first, by the British.[63]

Tanks in Battle then goes on to discuss the variety of battles fought in both World War I and II. The history is good to review, but we will draw two big conclusions from his work. The first is that tanks should be designed with a specific tactical task in mind.[64] The second is that because tanks can be used for deep penetrations cutting into the lines of communication of the enemy, tank design should incorporate advanced communications in order to keep the lead tank columns in touch with higher headquarters.[65]

The number of books written on tanks and armored warfare is almost limitless, but it is important to set the historical context of some of the works that held a more

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[61]Ibid., 15.

[62]Ibid., 28.

[63]Ibid., 37-43.

[64]Ibid., 105.

[65]Ibid., 115.

common viewpoint before stating common themes throughout the vast majority of the books read and noted in the bibliography.

Common Argument for Tank Employment

The vast majority of writers on tank theory stressed the need to fight in concentrated units of tanks and not spread out piecemeal as infantry support. The importance of this lesson was learned as the British initially spread their tanks to many units throughout the front during World War I. The battles of Cambrai and Viller-Bretonneux showed the initial capabilities of tanks massed to pierce a specific point in the enemy's line and advance deep into the enemy's rear, followed up by infantry support.[66]

Tanks should be used as part of a combined arms team. The Germans, between the world wars, learned that they should attack in a concentrated area for a breakthrough rather than attacking across a broad front like the British and French interwar doctrine. Because of this, the Germans required detailed integration of all their weapon systems, including close air support, tanks, infantry and artillery. Subordinate commanders would lead from the front lines instead of the command post, and because they understood the higher commanders' intent, the German officers could make rapid decision making in support of fluid mechanized combat.[67] Despite this, the Germans themselves were not sold on Blitzkrieg until the 1940 fall of France.

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[66]Cary, *Tanks and Armor,* 67.

[67]Jonathan M. House, *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization* (Fort Leavenworth, KS: US Army Command and General Staff College Press, 1984), 53.

Tanks should not be used against prepared enemy infantry and AT positions on the ground of the enemy's choosing. Many of the tank theorists from 20 years ago make a point to bring this out in their writings. No writing espoused the great virtues of pure tank units against any enemy weapon system.[68] It is important to note that few original thinkers on mechanized warfare of their day espoused the idea of pure tank elements charging through the enemy ranks, J.F.C Fuller's Plan 1919 notwithstanding. During the interwar period, there was a generally held belief that AT defenses were becoming stronger, and like today, many believed that tanks were now overcome by weapons that costs less and could be mass produced easier. Heinz Guderian did not take this as a sign of the early demise of the tank, rather he integrated AT weapon systems into a combined arms construct that permitted German tanks in World War II to withdraw upon contact with enemy tanks and lead them into an AT ambush. Guderian knew the strength of and how to use armor; it was not rushing blindly into enemy positions.[69]

Tanks should be used for deep penetrations into the enemy's lines of communication. From its very inception, tanks were utilized to penetrate the enemy's front lines and allow for further exploitation for follow on forces, though the concept of combined arms with mechanized forces did not fully develop until later.[70] The idea of using armor units to conduct penetrations deep into enemy lines further developed during World War II. The German campaigns against the Polish and French showed a developing strategy and usefulness in utilizing armored units in deep strikes. Always

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[68]Rogers, *Tanks in Battle,* 15.

[69]House, *Toward Combined Arms Warfare,* 54-57.

[70]Cary, *Tanks and Armor,* 74.

remembering the need for combined action by tanks, artillery and infantry within the panzer divisions. The strategy on the invasion of Poland was a concept of a weak center with two powerful attacking wings was traditional in German strategy, bought into a modern mechanized setting. The foundations of the strategy lay in Count von Schlieffen's classic study of Hannibal's victory at Cannae.[71]

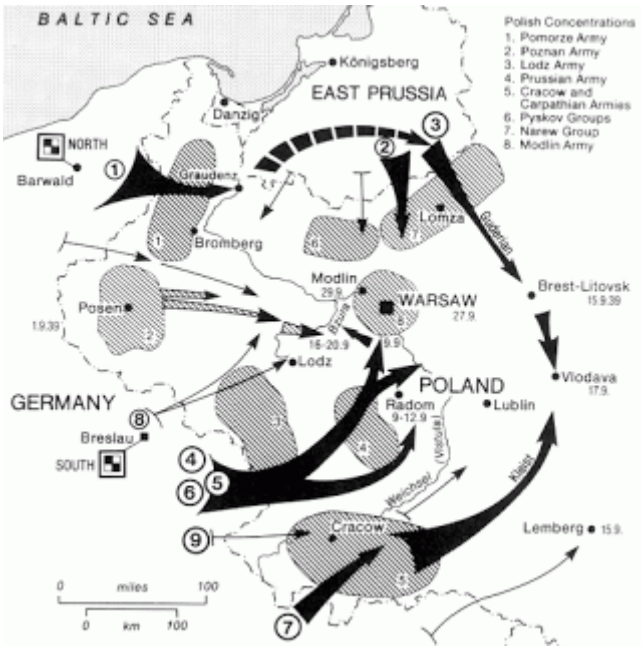

Figure 3. Operation Weiss, The Invasion of Poland

Source: Image used from http://wehrmachtcommanders.blogspot.com/ 2011_09_01_archive.html (accessed 5 May 2014).

[71]Friedrich Wilhelm von Mellenthin, *Panzer Battles: A Study of the Employment of Armor in the Second World War*, Edited by Leonard Charles Frederick Turner (Norman: University of Oklahoma Press, 1956), 5.

The U.S. led operation to liberate Kuwait from Iraqi occupation illustrated the concept of armored units' penetration deep within the enemy rear. This was a combined arms operation fought at the coalition level. American aircraft flew more than 112,000 individual sorties in less than 40 days, though this did not cause the withdrawal of the Iraqi forces. The U.S. Third Army conducted a two corps attack deep into the enemy rear, astride its lines of supply and communication back to Baghdad. VII Corps was assigned the main attack and once astride the enemy lines of communication, was able to conduct a 90-degree turn to the east to destroy the encircled Iraqi forces.[72]

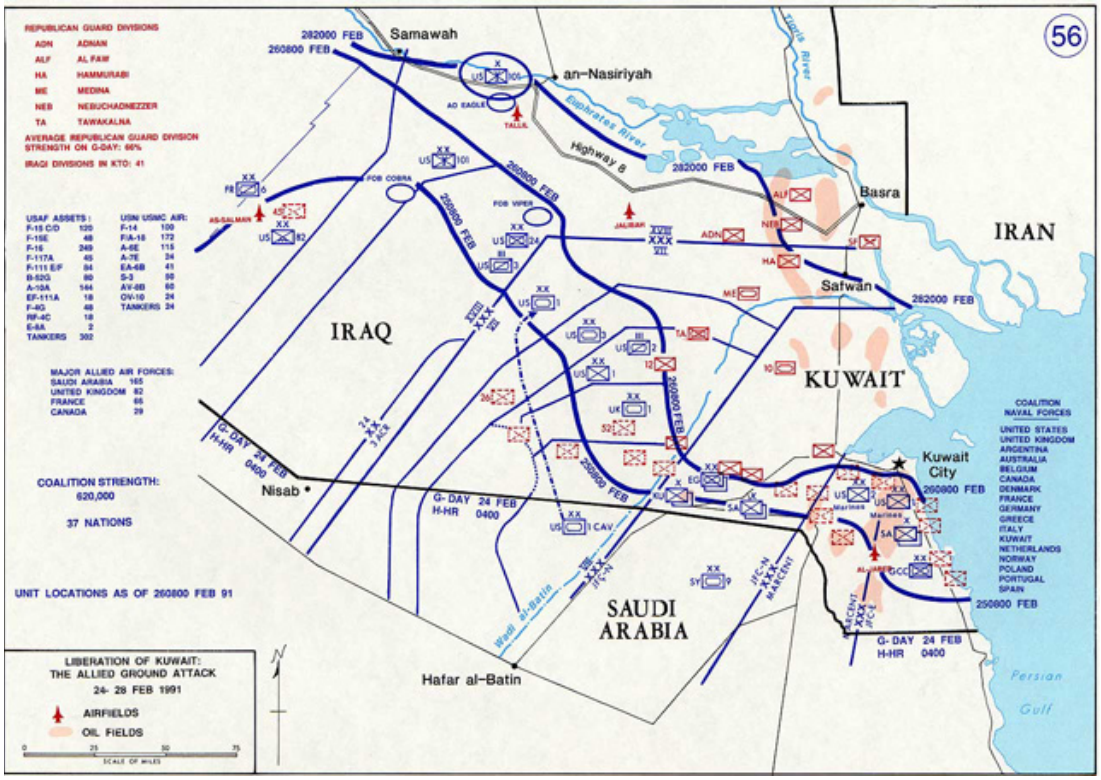

Figure 4. The Invasion of Iraq

Source: The West Point Atlas of United States Wars, Courtesy of the United States Military Academy.

[72]George F. Hofmann and Donn A. Starry, eds. *Camp Colt to Desert Storm: The History of US Armored Forces* (Lexington: University Press of Kentucky, 2014), 507.

Operation Desert Storm showed how armored units in a combined arms construct, focusing on objectives to the rear, enabling the enemy encirclement or displacement is a good use of tanks in modern warfare.

Antithesis Arguments Against Tank Employment

Not everyone agrees on the employment of tanks or even the usefulness of tanks at all. Though I could not find a book written against tanks, I found a few articles and blogs written about why the Army no longer needs tanks. All of the arguments boil down into two camps. The first is that tanks can be destroyed by a Molotov cocktail or ATGMs which costs less and can be mass produced.[73] The second argument is that tanks are too expensive to train the crew, equip, maintain, and sustain. This is especially since there are other platforms that can rapidly deploy around the world to perform similar tasks, like the M1126 Striker. Some see these platforms perform in the modern operating environment, in a future conflict dominated by counter insurgency and irregular warfare, as replacing the no longer needed tank. This mode of thought was neatly summed up in Gian P. Gentiles' satirical piece for the *Small Wars Journal*.[74]

Examining the lessons learned from the 2006 Israeli-Hezbollah war, it is noted that some 1,000 ATGMs were fired. A total of 400 tanks from the Israel Defense Force were involved in the conflict. Out of these, some 48 tanks were hit, with 40 sustaining

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[73]John T. Reed, "Is the U.S. Army's Armor Branch a Fraud?" http://www.johntreed.com/armor.html (accessed 12 December 2013).

[74]Colonel Gian P. Gentile, "The Death of the Armor Corps," *Small Wars Journal* (17 April 2010): 6, http://smallwarsjournal.com/jrnl/art/the-death-of-the-armor-corps (accessed 25 September 2013).

some damage. 20 of these tanks were penetrated by the ATGM warhead, with five being destroyed. It is interesting to also note that more infantry died from ATGMs when IDF reservists bunched inside buildings then in small arms contact, though there are currently no calls for the removal of an outdated Infantry Branch.[75] Hezbollah showed considerable proficiency in utilizing ATGMs against all platforms and infantry utilizing a method of firing of a number of weapons at targets crossing predetermined points. One of the key problems is that tanks were asked by the Israel Defense Force command to operate by themselves in difficult terrain. In restrictive terrain, tanks must be used in a combined arms organization supported by a minimum of infantry, engineers, and artillery.[76]

It is difficult to come to concrete conclusions, though some point to the 2006 war as the death of tanks, especially since there were many factors that are unknown. The Israel Defense Force operated slowly and along easily predictable lines of approach against prepared AT ambushes. This automatically violates a common rule of tank proponents to avoid such situations. It is also unknown what would have happened if tanks were used to quickly penetrate through unanticipated avenues of approach with combined arms. Moreover, it is not certain what the causalities would have been without armored support. The Israeli response to the ATGM threat was not to abandon the tank, but to increase the development and production of the 105-mm antipersonnel round for their Merkava main battle tank. Another response to the success of Hezbollah was an announcement that Merkava Mark IV tanks would be fitted with an active armor system

[75]Cordesman, Sullivan, and Sullivan, 111.

[76]Ibid., 109.

called Trophy. This system will identify incoming threats and destroy them before impact.[77]

In terms of the holistic costs of tanks, it will be useful to start with the overall budget of the Army. The fiscal year 2014 and 2015 budget levels as stipulated by the bipartisan budget agreement stipulates caps on Defense discretionary spending of $520,464,000,000 and $521,272,000,000 respectively.[78] General Odierno in his 3 April 2014 statement to the Senate Armed Services Committee stated that the Army's funding level was $120.5 billion of the Defense budget.[79] It should be noted that the Operation and Maintenance, Army reports that the entire budget for Operation and Maintenance, Army for fiscal year 2104 is approximately 35.1 Billion.[80] While reports from the Under Secretary of Defense (Comptroller) vary sometimes by billions due to recent turbulence in budgeting, the FY2015 reports showed a slight adjustment to the final numbers for FY 2014 and proposed numbers for 2015. The FY 2014 enacted Operation and Maintenance, Army (active) was $30.6 Billion for 2014 and a proposed 33.2 Billion for FY 2015.

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[77]Ibid., 112.

[78]U.S. House of Representatives, Committee on the Budget, *Summary of the Bipartisan Budget Act of 2013*, December 2013, http://budget.house.gov/uploadedfiles/bba2013summary.pdf (accessed 21 January 2014), 1.

[79]U.S. Senate, Committee on Armed Services, *Posture of the Department of the Army*, Hearing 3 April 2014 (Washington, DC: Government Printing Office, 2014), 8.

[80]Department of the Army, *Fiscal Year (FY) 2104 Budget Estimates, Volume I Operational and Maintenance* (Washington, DC: Government Printing Office, April 2013), 16.

While the information will be used in chapter 4 as a budget analysis of the maintenance and operation expense of Tanks and possible methods of reduction of that expense.[81]

Table 1. O&M TOA by Service by Appropriation

$ in Millions Funding Summary	FY 2013 Actual	Price Growth	Program Growth	FY 2014 Enacted	Price Growth	Program Growth	FY 2015 Estimate
Army	**80,143.4**	**1,347.2**	**-41,048.3**	**40,442.3**	**395.0**	**924.0**	**41,761.5**
Active	*64,804.6*	*1,158.5*	*-35,319.2*	*30,643.9*	*241.0*	*2,355.2*	*33,240.1*
Reserve	3,022.4	46.9	-128.4	2,940.9	49.2	-499.6	2,490.6
National Guard	7,045.2	61.5	-249.2	6,857.5	104.8	-931.6	6,030.8
Afghanistan Security Forces Fund	4,946.2	74.5		-5,020.7	0.0	0.0	
Afghanistan Infrastructure Fund	325.0	5.8		-330.8	0.0	0.0	

Source: Department of Defense, *Operation and Maintenance Overview: Fiscal Year 2015 Budget Estimates* (Washington, DC: Government Printing Office, March 2014), http://comptroller.defense.gov/BudgetMaterials.aspx (accessed 1 April 2014).

The costs associated with tanks can be prohibitive. The author found little that can be done in the short term to lower the maintenance and supporting costs of tank fleet upkeep. Chapters 4 and 5 will explore some of the longer term projects that may reduce costs.

[81]Department of Defense, *Operation and Maintenance Overview: Fiscal Year 2015 Budget Estimates* (Washington, DC: Government Printing Office, March 2014), http://comptroller.defense.gov/BudgetMaterials.aspx (accessed 1 April 2014), 6.

CHAPTER 3

RESEARCH METHODOLOGY

Overview

This study examines the role and function of armor facing potential adversaries to the United States in 2030 utilizing the AirSea Battle concept. Chapter 1 discussed the potential of using Russian, Chinese and Hezbollah forces as a basis to facilitate a study on the utility of an armored force in A2/AD. Chapter 1 also introduced the need for the armored community to discuss ways and means, shortening the intense logistical demand that training, equipping and deploying an ABCT. Lastly, chapter 1 discussed the possibility of exploring methods of fiscal responsibility in the employment of armor.

Chapter 2 reviewed the body of literature relevant to the subjects under discussion in this paper. The review examined existing United States Department of Defense doctrine, as well as Joint publications. A close examination of national military strategy and the *JOACs* provided an overview of the national focus and goals of the United States Government. A review of the AirSea Battle concept provided an understanding of what A2/AD consists of and the conclusion of the study will draw lessons for armor from this. Chapter 2 also looked at various published works that examine tanks and armor in general, ranging from modern examples to traditional historical usage of tanks and cavalry.

Chapter 2 finished with a record of the budget and what means the army has to implement its strategy or ends given in the 2011 *NMS*, the 2010 *NSS*, the 2012 *Sustaining U.S. Global Leadership* as well as the 2012 *JOAC* and the new 2014 *QDR*. This chapter discussed the research methodology chosen and each of the components of the

methodology as well as the analytical tool that will be used to organize the data reviewed in chapter 2.

Research Methodology

This chapter focuses on the general methodology used to conduct this study. The research methodology employed in this study will be divided between qualitative and quantitative methodologies to answer what the primary research question: What will be the form and function of the armored force in 2030?

Qualitative Method

The following questions will use the qualitative method: How does armor contribute to AirSea Battle, especially in the realm of Area Denial? Is the organizational structure of the ABCT an effective organization to answer future hybrid threats? Because these questions will be researched through United States military doctrine, Joint publications, and a general study of area denial tactics used by example forces, the focus will be qualitative in nature and will attempt to draw lessons from published works to draw conclusions to support the questions listed above.

There are two more questions examined in this study that will require a qualitative process. These two additional questions are: How can armor retain maneuverability and firepower at a reduced cost? How can we shorten the logistical need or create logistical efficiency in utilizing armor? Information will be taken from documentation similar to the Congressional Budget Office, determining the amount of money spent on defense, especially on armor in training, maintaining and deploying. This study will also examine capability gaps or acquisition needs in general to conduct area denial in a fiscally

responsible manner. The acquisition program baseline will also be examined, specifically in sustainment costs. The research conducted will also examine the maintenance support planning, system support package and supportability considerations of the ABCT, especially deployed in an area denial mission.

Theories Used

The qualitative method used will be based on grounded theory research, and include some applications of case study methods as appropriate. Grounded theory was chosen as the primary method is that the intent of grounded theory study is to take descriptions of a process or an action and move beyond to establish, generate or discover a theory as an end result.[82]

The key concept is that the theory developed does not come from one source readily packaged but is "grounded" in data from people who wrote or experienced the process one is writing about. Therefore, the grounded theory is a design in which a general explanation or theory is shaped by the views of a large number of sources.[83]

Some of the defining features that will be used is that the paper will focus on the action of armored theory and the use thereof. Using the data from books, periodicals, Army doctrine and multiple other sources to determine the answer and propose a general theory on the function of armor in an A2/AD environment. The conclusion of this study will also include a proposal on a theory on the use of armed forces, particularly those defined as tanks. While there are many definitions of what a theory is, this thesis will

[82]John W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (Thousand Oaks, CA: Sage, 2012), 83.

[83]Ibid., 83, 84.

offer an explanation or understanding that was developed during the process of using the qualitative method of grounded theory.[84]

The different parts of the qualitative method used is represented in the figure below to visually show which part of ground theory and case study is used during what process of the these.

Data Sources

The form of data collection will be borrowed from case study theory rather than grounded theory. While grounded theory seeks to collect information often from interviewing and comparing the data gleaned from interviews, the method used in this research will be more extensive. Case study methods typically draw on multiple sources of information, including documents, observations and archival records. Many of these sources are discussed in chapter 2, the literature review, and therefore will be used as the sources to draw on that will help in an end theory rather than interviews normally used in grounded theory. The data collection for this research has been from strategic papers, including the 2011 *NMS*, the 2010 *NSS*, the 2012 *Sustaining U.S. Global Leadership* as well as the 2012 *JOAC* and the new 2014 *QDR.* A host of books on the topic of armor was used from a variety of different opinions. Other sources include a look at what A2/AD means within the AirSea Battle Concept and what doctrine is currently saying in regards to the role of armor. For budgetary sources, the vast majority of the sources either comes from the congressional budget, the department of defense undersecretary and the testimony from hearings to the armed services committees from both houses. Logistical

[84]Ibid., 85.

information was derived from source like FMSweb and OPLOG planner, as well as logistical doctrine.[85]

Table 2. Qualititative Method Grounded Theory and Case Study Mixture

	Focus	Data Collection	Data Analysis	Result
Grounded Theory	Theory grounded in data from the field		Formed Categories using open coding	Generating a theory
Case Study		Using Multiple sources		

Source: Created by author, based on information used from John W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (Thousand Oaks, CA: Sage Publishing, 2012).

Data Analysis

Data analysis will be similar to the analytical method the Department of Defense uses to examine capabilities-based analysis. The *Joint Capabilities Integration and Development System* Manual dated 19 January 2012 is the basis of the categories chosen using what ground theory calls open coding. Open Coding is essentially forming categories to analyze data collected in order to form a theory.[86]

Because the Joint Capabilities Integration and Development System process is a lengthy one, this thesis will focus on the DOTMLPF analysis to form the categories and

[85]Ibid., 100.

[86]Ibid., 89.

provide some organization to the data in order to better form the final conclusion. The basis of the definition of each category is taken from the *Joint Capabilities Integration and Development System* Manual.[87]

"Doctrine" includes the fundamental principles that guide the employment of U.S. military forces toward a common objective. Doctrine is neither policy nor strategy. "Organization" is a unit or element with different functions enabled through the structure through which individuals cooperate toward a common goal. "Training" is utilizing doctrine or tactics, techniques and procedures to prepare staff and forces to conduct necessary tasks. "Materiel" is all items necessary to equip, operate, maintain and support military activities. "Leadership and education" is the continuum of learning that made up of training experience, education and self-improvement. "Personnel" component insures that enough qualified personnel exist to support the capability requirement. "Facilities" are real property consisting of buildings, structures, utility systems, associated roads and underlying land. Chapter 4 will discuss each category of the DOTMLPF construct in analyzing the data review in chapter 2.

Summary

The primary research question is answered by using primarily the qualitative method of grounded theory, though case study methodology informed the collection of the data as it provides for a wider collection to be used. This study will utilize information from official congressional budget, army force management, and army

[87]Department of Defense, *Manual for the Operation of Joint Capabilities Integration and Development System* (Washington, DC: Government Printing Office, 19 January 2014), https://acc.dau.mil/jcids (accessed 1 April 2014), A-4.

logistics and sustain doctrine on ways to lessen the logistic and maintenance burden without impact to the maneuverability and firepower of the tank. This study also examines published works, doctrine and historical examples through the use of a data analytical method called DOTMLPF to draw conclusions and recommendations of the function of the armored force in 2030.

CHAPTER 4

ANALYSIS

Introduction

The primary research question is what will be the form and function of the armored force in 2030? I will answer that question, as well as the secondary research questions through the qualitative method explained in chapter 3. Using grounded theory to propose an answer for my primary research question, this chapter uses the DOTMLPF gap analysis to categories the research conducted. This chapter will break down each of the DOTMLPF categories and organize the data gathered into each category. The purpose of this gap analysis is to provide the reader with an organized method to understand the data gathered and to enable development of assumptions and potential recommendations for the future of tank warfare. An important component of this chapter is the review of secondary questions and their DOTMLPF categorization.

The question of how armor contributes to AirSea Battle, especially within the concept of A2/AD, will be examined in multiple categories, primarily doctrine, material (as it applies to preforming in an A2/AD environment), facilities and policy. The second question concerning the organizational structure of the ABCT as an effective organization to answer future hybrid threats is answered in the organization section. This paper also addresses budgetary problems while employing tanks in two parts. First, how can armor retain maneuverability and firepower at a reduced cost, addressed primarily with consideration to materiel, facilities and policy? Second, how can we reduce the logistical need or create logistical efficiency in utilizing armor? Lastly, we examine the

final question of the historical lessons on the use of armor/cavalry that can be applied today across the DOTMLPF spectrum.

Chapter 5 draws conclusions from the data analyzed in this chapter and also gives recommendations for the plenitude of research that could follow this thesis.

Doctrine

ADP 1-0, *The Army,* provides us an introduction to the Army's basic operational doctrine called unified land operations emphasizing the criticality of synchronizing our capabilities within the joint construct. This is applicable to armor as ADP 1-0 goes on to state that no major conflict has ever been won without boots on the ground. Soldiers are the ones to seize, occupy, and defend as well as secure land to be able to deter and defeat aggression.[88] This would lead us to conclude that the land forces would be the focus of our national military budget. The last Operation and Maintenance (O&M) 2015 reports that the Army will be last in all the services in base O&M projections with $41 Billion compared to the Air Force of $44 Billion and the Navy at $46 Billion.[89]

Unified land operations is expounded upon in ADRP 3-0, *Unified Land Operations*. It is defined as how the Army seizes, retains and exploits the initiative to gain and maintain a position of relative advantage through offense, defense and stability operations. This will allow the Army to prevent or deter conflict, prevail in war and set the conditions for conflict resolution. It is important to understand unified land operations

[88]Headquarters, Department of the Army, Army Doctrine Publication (ADP) 1, *The Army* (Washington, DC: Government Printing Office, 2012), 1-2, 1-4.

[89]Department of Defense, *Operation and Maintenance Overview: Fiscal Year 2015*, 234.

if we are to identify the role of armor in it.[90] Unified land operations acts within the operational environment that exists with mission variables. The Army's response to these variables is to act within the concept of decisive action. Decisive action is the continuous, simultaneous combination of offense, defense and stability tasks.[91]

The Army has been organized into brigade combat teams (BCTs) in order to conduct decisive action. Field Manual 3-90.6 details the Brigade Combat Team and the roles the Heavy Brigade Combat Team plays within decisive action. The Heavy Brigade Combat Team has been renamed the ABCT, but the written doctrine has yet to fully reflect this. This paper uses the new term when referencing the doctrine in existence today, even if the doctrine has not quite caught up. The ABCT is described as a balance of combined arms units that execute operations with shock and speed. This would put the ABCT primarily in the offensive role, with defense being called upon only as a means to reorganize and refit for further offensive operations.[92] Offensively minded, with the combined arms principles learned in World War II, the ABCT should be the perfect tool used to defeat A2/AD threats, but is it? The Field Manual goes on to say that the ABCT requires significant strategic air and sea lift to deploy and sustain. The ABCT fuel consumption may also limit operational reach. These statements both make sense, though the manual notes that the ABCT's unmatched tactical mobility and firepower offset

[90]Headquarters, Department of the Army, Army Doctrine Reference Publication (ADRP) 3-0, *Unified Land Operations* (Washington, DC: Government Printing Office, 2012), 1-1.

[91]Ibid., 2-2.

[92]Headquarters, Department of the Army FM 3-90.6, *Brigade Combat Team* (Washington, DC: Government Printing Office, 2010), 1-7.

this.[93] Firepower and mobility as assets do not by themselves overcome fuel consumption and significant lift requirements.

It is ambitious to state that the Department of Defense would want to have an infantry brigade combat team anywhere in the world in 96 hours. That infantry brigade combat team sets the conditions for the further deployment of follow on forces, one that could include an ABCT. The deployment of multiple ABCTs simultaneously requires more strategic lift than the Air Force or Navy is likely ever to have available at one time. This does not account for the continued supply requirements and air support that the ABCT would require to survive. This is why the Department of Defense depends on forward staging bases. This requirement is the exact reason that countries are developing A2/AD capabilities.[94]

Army Doctrine recognizes the need to continue to pursue emerging technologies to overcome enemy A2/AD developments but acknowledges the lack of funding as a problem to be addressed. It seems that the Army's answer is given in the Army Capstone document as the strategic solution. This document states that the Army must conduct prompt and sustained combat operations to defeat enemy land forces and focus on the enhancement of the personnel and flexibility needed to organize, train and equip based on missions. All of this is predicated on preventing wars, shaping the operational environment to be beneficial to the United States and its allies, and winning the nation's

[93]Ibid., 1-7.

[94]Andrew F. Krepinevich, Barry D. Watts, and Robert O. Work, *Meeting the Anti-Access and Area Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessments, 2003), ii.

wars. Winning the nation's wars are based on rapid deployment, positioning forces in a theater of operation and conducting unified land operations, as previously discussed.[95]

Doctrine Conclusion

While United States Army doctrine nests with general strategies and acknowledges budget shortfalls, Army doctrine seems to have a gap in addressing how doctrine is changing in the face of fiscal austerity. Conspicuously absent is any particular doctrine on addressing A2/AD threats. The Army plans on winning strategically by utilizing unified land operations to prevent future conflicts by shaping the operational environment to deter aggression. If deterrence fails, the Army uses its pre-positioned forces to win in any conflict. Yet the foundations for "winning" by the use of preposition forces are the very things that A2/AD targets. Rapid deployment with strategic lift capabilities we do not have in abundance and positioning forces in theaters have been identified as being increasingly threatened if it is not strengthened to meet an A2/AD capably enemy.[96] Currently, there is a gap that needs to be addressed. Doctrine needs to be written addressing A2/AD capabilities used against the Army and specifically what is the role of the ABCT in rapidly defeating the enemies A2/AD capabilities.

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[95]Headquarters, Department of the Army, *The U.S. Army Capstone Concept* (Washington, DC: Government Printing Office, 2012), 10-15.

[96]Jan Van Tol, Mark Gunzinger, Andrew Krepinevich, and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), 78.

Organization

ABCTs are combined arms units that execute operations with shock and speed. They are currently organized with two combined arms battalions that have a "2-by-2" design or that is, two armor companies and two mechanized infantry companies. These companies fight as combined arms teams and draw additional support from 120mm mortars, a scout platoon and a sniper squad internal to the battalion. The ABCT depends on the cavalry squadron for its reconnaissance with the fires battalion providing responsive and accurate artillery support. The fires battalion contains 16 self-propelled 155mm howitzers that are capable of keeping pace with the combined arms battalions. The brigade special troop's battalion provides command and control to the ABCT headquarters, an engineer company, military intelligence company, brigade signal company, military police platoon and chemical reconnaissance platoon. One could argue the most important piece to the ABCT is not a combat unit but the brigade support battalion. This unit is the organic sustainment of the entire brigade. This unit has four forward support companies (FSCs), one for each of the combined arms and fires battalions, and cavalry squadron. The support battalion also maintains organic support companies in order to facilitate sustainment surge to a battalion and also reach back to the sustainment brigade to pull supply forward.[97]

[97]Headquarters Department of the Army, Field Manual (FM) 3-90.6, *Brigade Combat Team* (Washington, DC: Government Printing Office September 2010), 1-8.

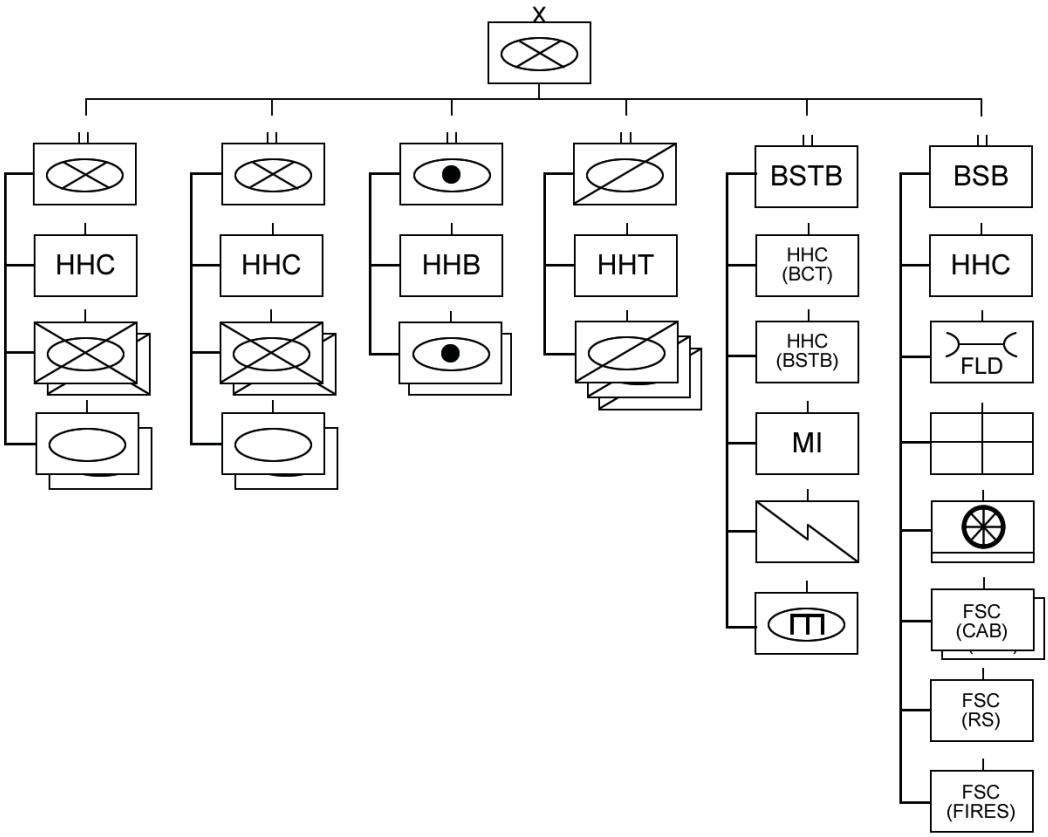

Figure 5. Heavy Brigade Combat Team

Source: Headquarters Department of the Army, Field Manual (FM) 3-90.6, *Brigade Combat Team* (Washington, DC: Government Printing Office September 2010), 1-7.

Field Manual 3-90.6 itself notes that supply consumption is the critical aspect of the ABCT and that fuel in particular could limit operational reach, a reach that may be critical in addressing key enemy A2/AD capabilities to be defeated. Capabilities such as integrated air defense systems, cruise and ballistic missiles as well as command and control nodes that are usually placed well behind enemy front lines. If we examine the distribution capability of the FSC we see that the FSCs assigned to the combined arms

battalions have six M978A4 HEMTT Fueler each that carries 2,500 gallons.[98] That is a total fuel carrying capacity of 15,000 gallons. If we consider that every tank in the battalion will need to be fueled every eight hours in combat situations and if we run offensive operations for just one day, with combat conducted 50 percent over paved roads, 30 percent over unimproved tracks and 20 percent over open terrain that battalion of 29 M1A1 tanks will need a staggering 69,844 gallons of JP8 or the equivalent of 27.94 tanker loads.[99] Compare this to the six fuelers the FSC actually has and we can see that these fuelers will be making multiple trips every day just to keep the tanks on the advance past one day.

Although many of the combat platforms in the ABCT are tracked, the vehicles that provide sustainment are wheeled. Wheeled vehicles are by and large bound to roads of some type and cannot keep up with the tracked vehicles' maneuverability. The M1A1 may well have a cruising range of 275 miles (442.56 km),[100] allowing it to attack command and control, logistical nodes and integrated air defense sites, but without the ability to refuel it becomes a glorified bunker at the end of that trip. The FSC can draw on the 18 additional HEMTT fuelers at the sustainment battalion level in case of an emergency,[101] but the sustainment battalion will be using the majority of these to pull

[98]FMSWeb data based on 47th Support Battalion MTOE for 2015.

[99]Army Logistical program OPLOG report run under the conditions stipulated in thesis.

[100]Global Security, "M-1 Abrams Main Battle Tank," http://www.global security.org/military/systems/ground/m1-specs.htm (accessed 5 May 2014).

[101]FMSWeb data based on 47th Support Battalion MTOE for 2015.

fuel requirements from the sustainment brigade and act as replacements for all FSCs in case of a mechanical breakdown or destruction of the fuelers already distributed.

Organizational Conclusion

While the organization of the ABCT as the combined arms team learned from lessons in World War II, the logistics of the brigade has not been given the tools needed to support a sustained offense by the ABCT itself. One author proposes that all services that support their combat units need the same mobility and almost the same level of protection. This would enable them to go where the units they need to support are, but almost as fast.[102] Additional fuelers are needed to make up for the significant fuel supply requirements caused by employing tanks in sustained offensive operations. If armor cannot continue offensive operations, then they no longer provide the mobility, and shock required in Army doctrine.

Training

Training soldiers to be tankers is an ongoing event. There are three training domains that provide ways to achieve strategic ends. The institutional domain includes initial military training and professional military education at the variety of leadership schools starting with the warriors leaders course and culminating in the command sergeant majors academy. There are also specialized schools for officers choosing the tank profession such as the cavalry leader's course. The second domain is the operational domain. This domain gives practical experience to all the institutional training the soldiers and leaders have gone through. These include combat training centers such as the

[102]House, *Toward Combined Arms Warfare*, 188.

National Training Center where soldiers deploy and apply their armor specific skills in a simulated combat environment. These training centers tend to focus on brigade and below, but there are training programs for division and corps as well. The Mission Command Training Program is the Army's primary training center for mission command exercise for these higher echelon staff. The final domain is self-development. Self-development is meant to put the onus on the individual to fill the gaps in learning by self-discipline in filling these gaps and pursuing knowledge on ones on to fill these gaps.[103]

The individual Army tanker goes through specific training to increase his skills on the M1A1 and variants. Starting with individual training at Fort Benning, he continues with his training as a loader and driver, understanding how to maintain and employ the tank at a basic soldier level. The unit then takes over the soldiers training to help them understand how to employ the tank as a crew. Tank Gunnery is one of the most important aspects of this training. The last 13 years of counter insurgency focused combat has decreased their proficiency at or even precluded tankers from conducting gunnery. It is not uncommon to find units that have some staff sergeants, most sergeants and most if not all of the junior enlisted soldiers that have never conducted a tank gunnery, or rotated through the National Training Center on their tank platform.[104]

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[103]Headquarters, Department of the Army, *The Army Training Strategy*, 3 October 2012, https://www.lt2portal.org/FileGatekeeper.aspx?file=LT2_L0/NewsAttachments/d13e82e9-de93-45ea-a695-5630e50d7912/6f49bcbc-6a0f-41b7-8e18-e59c89a6fed8/2012-10-18_Army_Training_Strategy__CSA_Approved_.pdf&download=true (accessed 1 May 2014), 10-16.

[104]Based on the author's personal observations as an armor company commander and not meant to be indicative of the entire army or armor branch.

Training Conclusions

Training domains in the Army is very organized and provides every soldier an ample amount of training. The Chairman of the Joint Chiefs General Martin Dempsey wrote in the forward for the Center of the Army Profession and Ethic Combined Arms Center, TRADOC *Army: Profession of Arms:*

> After almost a decade of war, our soldiers and leaders continue to perform magnificently. Yet, I'm often asked how we will regain some of our lost skills. While I acknowledge that some skills have eroded, as the Army's proponent for training and leader development, I like the problem I have. Our Army exhibits all of the qualities and attributes articulated in The Army Values. We know who we are, and that is a great foundation on which to build.[105]

My only observation is that we need to get back to honing gunnery skills for our tankers so they can prepare for the balanced aspects of decisive action.

Materiel

As previously remarked, students of tank warfare often observe that tanks should be designed for a tactical task.[106] It is useful to take a moment to discover what principles guided the Abrams tank's design. The original concept was to conform to these priority rankings:[107]

1. Crew survivability
2. Surveillance and target acquisition performance
3. First and subsequent round hit probability
4. Time to acquire and hit target

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[105]Center for the Army Profession and Ethic Army Profession of Arms 2011, i.

[106]Rogers, *Tanks in Battle,*105.

[107]Hofmann and Starry, *Camp Colt to Desert Storm*, 436.

5. Cross-county mobility

6. Complementary armament integration

7. Equipment survivability

8. Environmental impact

9. Silhouette

10. Acceleration and deceleration

11. Ammunition storage

12. Human factors

13. Ease of production

14. Range

15. Speed

16. Diagnostic aide

17. Growth potential

19. Support equipment

20. Transportability.

It is interesting to note that range and speed are number 14 and 15 on this long list while protection of the crew is number one. With this as a basis for tank design and with General Abrams' decision to adopt Chobham armor despite the additional weight involved, the XM1 tank was born. Without going into the extensive history of how the Abrams tank design was accomplished, readers can extrapolate that the tank was designed to survive mechanized combat at close range while acquiring, targeting,

engaging and destroying multiple targets. Crew survivability was always the number one priority in the Abrams tank program.[108]

Compare the M1A1 Abrams and variants with the A2/AD threat. Enemies that employ A2/AD strategies rely on integrated air defense and destroy cruise and ballistic missile platforms in order to deny access. These enemies target unhardened forward staging bases, logistical convoys and carrier groups. In order to defeat A2/AD tactics, there is a need to conduct sustained penetrating strikes deep astride enemy lines of communication in order to destroy integrated air defense and destroy cruise and ballistic missile platforms. The Abrams tank was designed to defeat waves of enemy vehicles, while operating from forward lodgments in Western Europe. The current tactics employed by potential enemies seek to prevent the buildup of armored forces and prevent their logistical resupply. It starts to become a little clearer that the order of priorities listed for tank development may need to be adjusted in order to meet the current changes in the operating environment. While it is beyond the scope of this paper to design a completely new platform, a few recommendations can be considered if designing a tank to meet the new A2/AD threat posed by the United States most likely enemies.

Materiel Conclusion

Any tank will have to be able to sustain itself for longer periods of time while conducting offensive operations deep astride the enemy lines of communication. Efforts to shift the focus of the US future tank system away from concerns about wave after wave of enemy armored vehicles and toward quick thrusts to destroy integrated air

[108]Ibid., 460.

defense systems and cruise/ballistic missile sites could be preferable in future wars. While survivability will always remain key, research must be made to lighten armor, extend fuel economy and maintain or increase firepower. Some of these methods will be explored in the next chapter.

Leadership and Personnel

Leadership and personnel in war are important and there are many books written on the topic. In regards to direct strategic level leadership involvement in overcoming the A2/AD challenge, the leadership roles started in September 2009 when the US Air Force chief of staff, General Norton Schwartz, and the US Navy's chief of naval operations, Admiral Gary Roughead, signed a memo to develop a concept known as AirSea Battle.[109] The concept, in part, was to increase joint cooperation between the two services. Army contribution had initially been slow in coming, though in 2013 the AirSea Battle office issued a service collaboration to address A2/AD challenges. The crux of this document is to show the need to develop networked, integrated forces capable of attack-in-depth to disrupt, destroy and defeat adversary forces across all domains including land.[110]

This shows that joint leadership at the highest levels are concerned about the threat of A2/AD and are taking steps to counter A2/AD capabilities. It remains to subordinate leaders to develop the specific examples of how every service can implement AirSea Battle given in the AirSea Battle concept released.[111] Applicable to the armor

[109]Krepinevich, *Why AirSea Battle*, 2010, 1.

[110]Air-Sea Battle Office, 4.

[111]Ibid., 10.

community would be continuing the subordinate concept development in support of AirSea Battle, which is in part the goal of the work of this thesis. Additionally, the armor leadership community can develop tactics, techniques and procedures that address the A2/AD environment. Collaborating on service resource planning and programming will be important if there are important changes to be made to the main battle tank of the United States ensuring we receive the funding necessary to develop and produce a tank specific to the demands of the A2/AD environment. The Army doctrinal recommendations provided above require collaboration with the other Services in order to improve the AirSea Battle concept and in a specific example by asking services to incorporate AirSea Battle and counter A2/AD ideas into Joint and service doctrine.[112]

Facilities

There is an operational and sustainment weakness in fighting against nations, like China, that employ A2/AD capabilities to deny access. The Western Pacific area, especially west of Guam, presents a logistical challenge, and sustainment and logistics are the life blood of armor. The current naval logistics force size is adjusted to support peacetime and the counter insurgency wars that we have been involved with in the last 13 years. These sea lines of communications have gone with almost little or no threat. This will not be the case in a war with nations that employ A2/AD capabilities. The shortage of logistical ships and assets will be further strained as ports, and forward operating bases with their facilities become damaged or unusable due to PLA missiles, mines and blockades by submarines. The facilities must be prepared because rearming across the

[112]Ibid., 10-12.

Western Pacific from rear areas would greatly extend operational timelines.[113] The Army must use forward operating bases either on U.S. soil or utilize allies that are willing to accept the likelihood that these bases would be targeted. Without this, the fuel hungry tank would not be able to provide mobility, shock and aggressive action for more than a few days. Bases should be placed at distances that would make China choose its targets carefully due to the limited number of medium to long range missiles. Bases too close to the battle zone could not use missile exhaustion techniques due to the plethora of short range missiles in the PLA inventory. Vital bases such as Guam should incorporate active and passive missile defense systems to reduce damage and increase the number of Chinese missiles needed to achieve degradation of these bases. These facilities could also adapt rapid repair and mediation capabilities to restore base functionality to essential levels.[114]

A second method to protect our logistical supply bases and facilities is to spread them out in multiple-smaller bases in many other partner states throughout the region, such as Singapore, India, the Philippines, Australia and the Philippines. This would mitigate the impact of A2/AD assets by forcing these platforms to spread out over more targets, especially if the US stockpiles needed war reserve materials such as munitions, maintenance spares and fuel there. Additionally, our anti-submarine warfare capability will remain a critical component to defending our facilities and logistical convoys. As the PLA-Navy submarine force is attrited, more ships can be diverted to other roles.[115]

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[113]Van Tol et al., *AirSea Battle*, 47.

[114]Ibid., 78.

[115]Ibid., 79.

History

While not a category of the DOTMLPF, Historical analysis is a critical part of examining how something was used in the past to give some possible insights on how it can be used in similar situations. History is not a blueprint, and care should be given to use it as a carbon copy answer or an easy-win plan to simply be over laid on top of any given problem. We can take some common themes noted in Chapter 2 and apply them against A2/AD.

Tanks must be part of any combined arms team. In an A2/AD environment this can be taken one step further. Planned integration of Armor into the Joint force allows the abilities and actions of that force to operate across all domains, enabling a cross-domain synergy. The land domain is critical but is not the only domain. The Army and its armored force needs to develop into pre-integrated joint force organizations, in order to maintain an advantage over enemies seeking to use a domain that the U.S. does not dominate in order to deny access across the spectrum of domains. These forces should be integrated prior to entering a theater, enhanced by joint and combined training against A2/AD capabilities at our training centers. Pre-integration should encourage, and must ensure service collaboration in material programs, enhancing operability and building the strength of one service against the weakness of the other.[116] Tanks can be a fundamental part of this integration and training.

Tanks should not be used against prepared AT enemy positions on ground of their choosing. Conversely, utilization of armor historically calls for deep penetrations against enemy lines of communications. Examining the developmental priorities of the Abrams

[116]Air-Sea Battle Office, 6.

tank project, the reader could assume that the tank was designed to withstand AT munitions and be used in tank on tank warfare against multiple waves of Soviet mechanized forces. In an A2/AD environment the threat is not primarily the enemy mechanized forces or their tanks, but the systems that deny access, primarily the SAMs in the integrated air defense systems and the cruise and ballistic missile systems. The design of a future battle tank should be examined in this light and changes could be recommended in the emphasis of protection over mobility. The argument that ATGMs can defeat tanks is correct, if taken in the extreme of one isolated tank moving through predictable avenues of approach without service or joint support. If integration is planned, programmed, and trained to match service strength against weakness, the usefulness of armor in an A2/AD will be brought out in the Joint AirSea Battle concept. The concept calls for an attack in depth to disrupt, destroy and defeat. No one service or part of a service can perform this alone.

Conclusion

This chapter used grounded theory to organize the data for analysis and to set the stage for proposing to answer my primary research question. This chapter looked at each of the categories of DOTMLPF and performed a gap analysis on the data in order to achieve clarity on the data analyzed. The question of how armor contributes to AirSea Battle, especially within the concept of A2/AD, was looked at in multiple categories, as it applies to preforming in an A2/AD environment. The second question concerning the organizational structure of the ABCT as an effective organization to answer future hybrid threats was examined in the organization section. This paper addressed budgetary problems while employing tanks in two parts. First, how can armor retain

maneuverability and firepower at a reduced cost, addressed primarily in the materiel, and facilities. Second, how can we reduce the logistical need or create logistical efficiency in utilizing armor? Lastly, looked at a final question of the historical lessons on the use of armor that can be applied today examined across the DOTMLPF spectrum.

In the next chapter, the paper seeks to draw conclusions from the data analyzed in this chapter and also give recommendations to anyone wanting to do follow on research on the topic of A2/AD, AirSea Battle and the application thereof to armor.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The conclusion of this thesis examines the steps that may be used in an attack by a nation using an A2/AD strategy. Then it examines some conclusions brought out in chapter 4 that could assist in developing a main battle tank that is fit for use in an integrated Joint anti-A2/AD environment.

For argument's sake, we will use the PLA. These steps were compiled and based on PLA writings, spelled out in a center for strategic and budgetary assessments on AirSea Battle.[117]

Large scale preemptive attacks would be designed to damage US forward bases and their regional military allies like Japan, and to use standoff missiles to keep the US Navy and Air Force out of range, disrupt space based command and control networks and contain operational logistics. The overall strategy would be to inflict substantial loss on US forces, extend the operational timeline and illustrate the United States' inability to defend its allies. The PLA would then deny the US the ability to build up regional forces or make it so costly to undo what would in effect be a fait accompli.[118] The first part would be to destroy or degrade the US and allied third-generation sensors and communications satellites using their laser and anti-satellite technology. This would be followed by their ballistic missile salvo attacks, augmented by cruise missile attacks

[117]Van Tol et al., *AirSea Battle*, 20.

[118]Ibid., 21.

against US and Allied air and naval bases, especially those with large fuel supplies. These would be launched from multiple land, air and sea based platforms. This would deny US Forces the ability to generate combat power or sustain that combat power. The PLA would then launch anti-ship and ballistic cruise missiles from various air, surface and submarines platforms against all major US Navy warships within 1,500nm of the Chinese coast. This would raise the costs of the US Forces attempting to force access in exclusive zones to prohibitive levels. Finally, the PLA would interdict US and Allied sea lines of communication throughout South East Asia and the Western Pacific. Their submarines could patrol out to Hawaii and in the Indian Ocean to interdict supplies and reinforcements moving toward forward bases forcing the U.S. Navy to respond and protect vulnerable convoys.[119]

What would be the role in armor in all of this? The Joint AirSea Battle concept is to attack in depth. While each service has its role to play, it is important that the US forces attempt to destroy missile stockpiles and platforms. The Air Force would be ideal for this if it wasn't for the Chinese integrated air defense systems and command and control. One possible solution could be to use tanks in a mechanized combined arms construct integrated in pre-arranged manner with joint forces to penetrate the enemy line at a narrow point, avoiding prepared AT enemy positions. The goal of the penetration would be to conduct a sustained advance across the enemy's lines of communication. Ideally, this would enable armor to find, fix and destroy PLA SAM sites, especially those mounted on vehicles or in prepared hardened positions.[120] The destruction or disruption

[119]Ibid., 21.

[120]Ibid., 20.

of enemy integrated air defense would allow for local air superiority by the air force to target and destroy the enemy's most numerous stockpiled missiles, that being the short range missiles. The destruction of this asset would enable the US Navy to conduct actions with more freedom of maneuver.

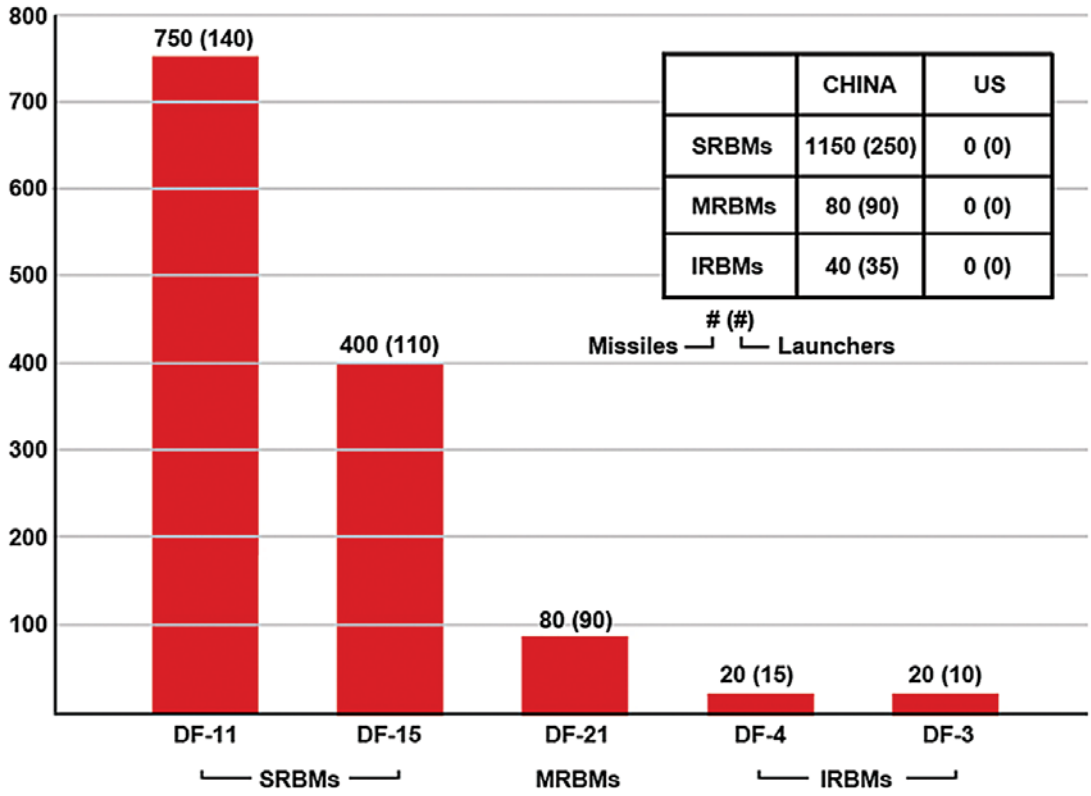

Figure 6. Chinese Missile Stockpiles

Source: Jan Van Tol, Mark Gunzinger, Andrew Krepinevich, and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic And Budgetary Assessments, 2010), 37.

There are changes this thesis recommends to prepare for armor for an A2/AD environment and role. These recommendations will not be specific, as specifics would

take working groups many years for each category, but these recommendations could act as possible avenues for further research.

Doctrine—Army doctrine is not entirely appropriate for addressing A2/AD threats. A good place to start is to examine doctrine in regards to rapid deployment with strategic lift implementation in order to project the force forward rapidly. Doctrine should specifically talk about the role of the ABCT in an A2/AD environment and how such forces will contribute to an overall joint campaign or operation in a counter A2/AD plan.

Organizational—The logistics of the ABCT and specifically FSCs could be augmented by the number of vehicles meant to transport fuel and munitions to the front in order to provide for longer sustained offensive operations, preventing mobile SAM platforms or enemy headquarters from escaping once penetration is achieved. These vehicles should be designed to have more protection and mobility in order to allow them to go where ever the forces they sustain go. A more robust logistical organization at the battalion level will allow the battalions to sustain combat operations for longer. If another battalion is added to the ABCT, then there will need to be another FSC added to the brigade support battalion in order to support it.

Training—The only recommendation given in this category is to get back to the basics of tank warfare down to the crew level conducting crew drills and yearly tank gunnery to obtain and retain basic armor skills that have been lost over 13 years of warfare that primarily required tanks to be left at home. The shift of the National Training Centers to decisive action training of Brigade level and below is a welcome change and will help in developing combined arms proficiency at the company level and higher.

Additional training events in a joint environment that focus on joint interoperability and specific challenges faced in an A2/AD environment would add to the already fantastic work that the men and women do at all our training centers around the world.

Material—The United States main battle tank could be redesigned or a new tank developed for specific tactical tasks that exist in an A2/AD environment. Sustained operations without ready logistical support must be a higher priority than in the current models. Tanks may need to conduct offensive operations for up to three or four days before requiring a stop for refueling and rearmament. Additional factors to this could be making the tank lighter, possibly through development of new technologies of lighter but just as protective armor. Another method could be making the engines used more fuel efficient. There are several proposals that could be looked at in more depth. The M1A1 turbine engine could be replaced with a more efficient turbine engine. Currently there are many possibilities including the LV100-5 gas turbine that was under development. It was reported to have reduced engine internal part count by 43 percent, improved reliability 400 percent, and consumed 50 percent less fuel at idle. This or a program like it could be restarted.[121] Recalling the early days of the XM1 development, General Dynamics proposed the Abrams Dieselization project at the 2013 Association of the United States Army Annual Meeting and Exposition, offering the Tognum America 12V883 diesel

[121]Defense Industry Daily, "Sustaining the M1 Abrams: US Army Puts a TIGER in its Tanks," 30 June 2011, http://www.defenseindustrydaily.com/sustaining-the-m1-abrams-us-army-puts-a-tiger-in-its-tanks-01790/ (accessed 4 February 2014).

engine and the Diehl 570P3 track.[122] The report cites new ways of injecting fuel, and quieter operations with a reduction in pollutants. The benefits of a diesel engine is its reduction in cost for an ABCT. General Dynamics reports the cost of such an engine to be $57,636 or a 14 percent reduction in costs and reducing the fuel and fuel tankers needed. That means a 50 percent reduction in fuel requirements on any combat day in comparison to the turbine version.[123] There are undoubtedly potential upfront costs in modifying the Abrams to fit a diesel engine in each Abrams in the inventory. Thus, installing diesel engines will undoubtedly be expensive. There are organizations such as TARDEC (Tank Automotive Research, Development and Engineer Center) that have many projects and proposals that can be useful for further study.

Leadership—The leadership of the Army continues to labor at protecting the nation, and it would be difficult for me to make recommendations other than what was already mentioned in the AirSea Battle concept service collaboration of 2013. That would be to take steps to continue the development of subordinate concepts in support of *JOAC* and AirSea Battle, and develop armor specific tactics, techniques and procedures that address the A2/AD environment. Continued collaboration on service resource and programming to develop systems needed to act as counter A2/AD so as to enable the strengths of on service that may have dominance in one domain, to be able to compliment another service that could be weaker in that domain.

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[122]Scott R. Gourley, "Abrams Dieselization Project: A Modest Proposal. Defense Media Network," 5 November 2013, http://www.defensemedianetwork.com/stories/abrams-dieselization-project-a-modest-proposal/ (accessed 8 November 2013).

[123]Ibid.

Facilities—While this is not an armor specific recommendation, the recommendations that follow allow for forward staging facilities to remain viable during a war using A2/AD and maintains the sustainability to armored forces in case of deployment, as well as provides bases to forward stage ABCTs. Hardening of existing bases to withstand impact from common cruise and ballistic missile system warheads is a good first start. The more impacts a forward support facility can sustain and still continue to operate, the better. The United States also diminishes the impact of missile technology by having treaties with multiple nations that allows for the establishment of many smaller forward operating bases instead of fewer large bases. Agreements with nations like Australia, New Zealand, Singapore, India, Japan and others can have a great effect in creating more targets than can be prosecuted with the same effect.

Research Questions

In reviewing the research questions, this thesis will take a moment and attempt to summarize the answers to each question. The details of these answers have already been explored in some detail in the paper.

What will be the form and function of the armored force in 2030? The previously mentioned recommended course of action will certainly change the armored force into one that is more integrated at the joint level. It will provide for traditional armor training, as well as new training focused on developing A2/AD threats while practicing the new doctrine written expressly to counter A2/AD capabilities. The tank itself will look different, because it must be more fuel efficient, either by becoming lighter or changing the efficiency of the engine used. Protection must remain or increase, but not at the expense of range or speed. Penetration levels involved with the firepower of the tank will

modestly increase to keep pace with advancements in protection, including extending the range of attack my rocket assisted rounds.

How does armor contribute to AirSea Battle, especially within the concept of A2/AD? The last two chapters have been dedicated to this subject and as more and more enemies adapt A2/AD strategies to deny the US access, it is an assessment of this author that all services will have to adapt to it or become irrelevant. Is the organizational structure of the ABCT an effective organization to answer future hybrid threats? If the main battle tank of the United States forces remains the same, the logistic support organization included in the ABCT must increase to facilitate sustained operations. This could include the addition of an additional supply organization within the sustainment battalion or augmenting the existing units with more fuel and transportation vehicles. In either case, sustainment assets need to have similar mobility and a level of protection to be able to sustain the force assigned to it.

There are two key questions to implement this. First, how can armor retain maneuverability and firepower at a reduced cost? Second, how can we reduce the logistical need or create logistical efficiency in utilizing armor? Both of these questions are linked, and during the conduct of research, it seems that there are not many ways to reduce the immediate costs of employing armor, indeed any change to armor will only incur more costs. The question that needs to be asked by others is the potential threat of countries growing A2/AD capabilities worth the investment to have cross domain dominance and synergy. Fuel efficiency, on the other hand, can create a long term reduction in costs to sustain the armored force. Either through new technologies in armor, or fuel efficiencies in engines. What are the historical lessons on the use of armor/cavalry

that can be applied today? The three themes that recurred throughout most of the research conducted is that history has recommended that tanks be used as part of a combined arms team and focused to penetrate the enemy front lines in order to cut the enemy's lines of communication and disrupt his command and control. The psychological results of having the tanks behind enemy lines, or charging across the battlefield destroying multiple targets within a minute cannot be over stated. All this being said, history also shows that not one platform can do everything. The tank is no exception. There are many historical examples of armored units acting alone without support and against prepared enemy positions with disastrous results. When used in a doctrinally sound manner, executing specific tactical tasks with the support of enabling capabilities in a combined arms formation, there are few things on land as powerful as a tank operating as part of an armored brigade.

Recommendations for Further Research

There are numerous different fields of research possible to enhance this subject.

Doctrine—There are ample research opportunities for future research to be conducted on what new doctrine should be incorporated that addresses emerging A2/AD threats. As the US Armed Forces continue to increase joint functionality and interoperability, doctrine will be the cornerstone to facilitate this and maintain a written record of lessons learned with tactics, techniques and procedures.

Organization—Continued research needs to be done on the exact ratio of sustaining units to command units. There is a need for a clear understanding of the amounts of strategic air and sea lift to forward deploy and support units in theaters that are in an active A2/AD environment. Additional research can also be done on

organizational efficiencies at the division and below. The amount of support units and the fuel, ammunition and maintenance requirements of those they support will only increase exponentially when faced with an A2/AD threat.

Materiel—A vast amount of research could be had in this field. An example is determining the required amount of war stocks in forward deployed areas to be able to withstand a prolonged engagement under threat of blockade. There are research possibilities in different types of armor that can be used on tanks and armor that is lighter yet retains its protective qualities. Research must focus on the area of fuel efficiency, accounting for different fuel types, as well as engine technology. What is the best engine for fuel efficiency that still performs at current or better standards?

The potential is endless and as long as there is war, there will be future topics to research about mounted warfare.

Summary

The future enemies of the United States will not fight us at our strengths. Like the Greeks of old fighting Persia, the enemies of the United States will attempt to prevent access to areas that can affect and influence their operating environment. Countries such as China, Iran, North Korea and many others are building weapon systems that coincide with a theme. That theme is A2/AD. The enemies and competitors of the United States know that if they give us the freedom to build forces in forward areas with unmolested sea lines of communication that the United States will prevail. Every service in the United States armed forces must adapt to this truth. Every service must change the way they do business to address how are enemy is going to counter us. Armor, as a subset of the Army is no different. We must change the way we fight, sustain and even adapt

doctrine so that we are an integrated part of the larger joint community. The armored force will exist well into 2030. Its composition and role will be defined by how the armor community as a whole acts today. Fighting changing conditions equates to extinction, while adapting to the reality of a changing operational environment ensure future relevance. There will always be mounted warriors, the platform itself might be different, but the spirit will remain.

BIBLIOGRAPHY

Published Books

Cary, James. *Tanks and Armor in Modern Warfare*. New York: F. Watts, 1966.

Cordesman, Anthony H., with George Sullivan, and William D. Sullivan. *Lessons of the 2006 Israeli-Hezbollah War*. Washington, DC: The CSIS Press, 2007.

Creswell, John W. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks, CA: Sage Publishing, 2012.

Dyster, Paul Albert. *In the Wake of the Tank: The 20th Century Evolution of the Theory of Armored Warfare*. Ann Arbor: University Microfilms, 1984.

Ellis, John. *Cavalry: The History of Mounted Warfare*. Westbridge Books, 1978.

Hofmann, George F., and Donn A. Starry, eds. *Camp Colt to Desert Storm: The History of US Armored Forces*. Lexington: University Press of Kentucky, 2014.

House, Jonathan M. *Combined Arms Warfare in the Twentieth Century*. Lawrence: University Press of Kansas, 2001.

———. *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization.* Fort Leavenworth, KS: US Army Command and General Staff College Press, 1984.

Hunnicutt, R. P. *Patton: A History of the American Main Battle Tank*. Novato, CA: Presidio Press, 1984.

———. *Patton: A History of the American Main Heavy Tank*. Novato, CA: Presidio Press, 1988.

Krepinevich, Andrew F., Barry D. Watts, and Robert O. Work. *Meeting the Anti-Access and Area Denial Challenge.* Washington, DC: Center for Strategic and Budgetary Assessments, 2003.

Mellenthin, Friedrich Wilhelm von. *Panzer Battles: A Study of the Employment of Armor in the Second World War*. Edited by Leonard Charles Frederick Turner. Norman: University of Oklahoma Press, 1956.

Merriam, Sharan B. *Qualitative Research: A Guide to Design and Implementation*. San Francisco, CA: John Wiley and Sons, 2009.

Murray, Williamson R., and Allan R. Millett, eds. *Military Innovation in the Interwar Period*. Cambridge: Cambridge University Press, 1998.

Rogers, Hugh Cuthbert Basset. *Tanks in Battle*. Vol. 8. London: Seeley, Service, 1965.

Smith, Gene. *Mounted Warriors: From Alexander the Great and Cromwell to Stuart, Sheridan, and Custer*. San Francisco, CA: John Wiley and Sons, 2009.

Smith, Thomas W. *"We Have It Damn Hard Out Here": The Civil War Letters of Sergeant Thomas W. Smith, 6th Pennsylvania Cavalry*. Kent, OH: Kent State University Press, 1999.

Starry, Donn, and George F. Hoffman. *Camp Colt to Desert Storm: The History of U.S. Armored Forces.* Lexington: University Press of Kentucky, 1999.

Stone, John. *The Tank Debate: Armor and the Anglo-American Military Tradition*. Amsterdam: Harwood Academic Publishers, 2000.

Congressional Hearings and Reports

Department of Defense. Annual Report to Congress, *Military and Security Developments Involving the People's Republic of China 2013.* Washington. DC: Government Printing Office, 2013.

U.S. House of Representatives. Committee on the Budget. *Summary of the Bipartisan Budget Act of 2013*. December 2013. http://budget.house.gov/uploadedfiles/bba2013summary.pdf (accessed 21 January 2014).

U.S. Senate. Committee on Armed Service. *Posture of the Department of the Army.* Hearing, 3 April 2014. Washington, DC: Government Printing Office, 2014.

———. Committee on Armed Service, Subcommittee on Airland Army Modernization. Hearing, 9 April 2014. Washington, DC: Government Printing Office, 2014.

———. Committee on Armed Service, Subcommittee on Readiness and Management Support. *Current Readiness of U.S. Forces.* Hearing, 26 March 2014. Washington, DC: Government Printing Office, 2014.

Published Theoretical And Doctrinal Sources

Air-Sea Battle Office. "Service Collaboration to Address Anti-Access and Area Denial Challenges." Unclassified summary 2013. http://www.defense.gov/pubs/ASB-ConceptImplementation-Summary-May-2013.pdf (accessed 15 January 2014).

Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1976.

Department of Defense. *Quadrennial Defense Review Report*. Washington, DC: Government Printing Office, 2010. http://www.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf (accessed 1 April 2014).

———. *Joint Operational Access Concept.* Washington, DC: Government Printing Office, January 2012. Approved for public release 17 January 2012.

———. *Operation and Maintenance Overview: Fiscal Year (FY) 2015 Budget Estimates*. Washington, DC: Government Printing Office, March 2014. http://comptroller.defense.gov/BudgetMaterials.aspx (accessed 1 April 2014).

———. *Manual for the Operation of Joint Capabilities Integration and Development System.* Washington, DC: Government Printing Office, 19 January 2014. https://acc.dau.mil/jcids (accessed 1 April 2014).

———. *Sustaining U.S. Global Leadership: Priorities for the 21st Century Defense.* Washington, DC: Government Printing Office, January 2012.

Headquarters, Department of the Army. Army Doctrine Publication (ADP) 1, *The Army* (Washington, DC: Government Printing Office, 2012.

———. Army Doctrine Publication 3-0, *Unified Land Operations*. Washington, DC: Government Printing Office, October 2011.

———. Army Doctrine Publication 3-90, *Offense and Defense*. Washington, DC: Government Printing Office, August 2012.

———. Army Doctrine Publication PAM 525-3-0, *The U.S. Army Capstone Concept*. Washington, DC: Government Printing Office, December 2012.

———. Army Doctrine Publication PAM 525-3-1, *The United States Army Operating Concept*. Washington, DC: Government Printing Office, August 2010.

———. Army Doctrine Publication PAM 600-3, *Commissioned Officer Professional Development and Career Management Concept*. Washington, DC: Government Printing Office, February 2010.

———. Army Doctrine Reference Publication (ADRP) 3-0, *Unified Land Operations*. Washington, DC: Government Printing Office, 2012.

———. Field Manual (FM) 3-90.6, *Brigade Combat Team.* Washington, DC: Government Printing Office September 2010.

———. *Fiscal Year (FY) 2014 Budget Estimates*. Washington, DC: Government Printing Office, 2013. http://comptroller.defense.gov/BudgetMaterials.aspx (accessed 1 April 2014).

———. *The Army Training Strategy*. https://www.lt2portal.org/FileGatekeeper.aspx?file=LT2_L0/NewsAttachments/d13e82e9-de93-45ea-a695-5630e50d7912/6f49bcbc-6a0f-41b7-8e18-e59c89a6fed8/2012-10-18_Army_Training_Strategy__CSA_Approved_.pdf&download=true (accessed 1 May 2014).

———. *The National Military Strategy of the United States of America.* Washington, DC: Government Printing Office, 2011. http://www.army.mil/info/references/docs/NMS%20FEB%202011.pdf (accessed 1 January 2014).

———. *The U.S. Army Capstone Concept.* Washington, DC: Government Printing Office, 2012.

Jomini, Antoine Henri. "Art of War." In *Roots of Strategy: Book 2,* edited by Thomas Raphael Phillips, 389. Harrisburg, PA: Stackpole Books, 1987.

Krepinevich, Andrew F. *Why AirSea Battle?*. Washington, DC: Center for Strategic and Budgetary Assessments, 2010.

Training and Doctrine Command. *Army: Profession of Arms 2011 The Profession After 10 Years of Persistent Conflict*. Fort Monroe, VA: Government Printing Office, 2010. http://cape.army.mil/repository/ProArms/Army%20Profession%20of%20Arms,%20v19,%2007OCT10,%20low%20resolution.pdf (accessed 1 April 2014).

———. *Operational Environments to 2028: The Strategic Environment for Unified Land Operations*. Fort Monroe, VA: Government Printing Office, May 2012.

The White House. *National Security Strategy*. 2010. http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf (accessed 21 December 2013).

Van Tol, Jan, Mark Gunzinger, Andrew Krepinevich, and Jim Thomas. *AirSea Battle: A Point-of-Departure Operational Concept*. Washington, DC: Center for Strategic and Budgetary Assessments, 2010.

Periodicals and Journals

Exum, Andrew. "Hizballah at War: A Military Assessment." Policy Focus no. 63 Washington, DC: Washington Institute for Near East Policy, December 2006.

Electronic Sources

Defense Industry Daily. “Sustaining the M1 Abrams: US Army Puts a TIGER in its Tanks.” 30 June 2011. http://www.defenseindustrydaily.com/sustaining-the-m1-abrams-us-army-puts-a-tiger-in-its-tanks-01790/ (accessed 4 February 2014).

Gentile, Gian P. “The Death of the Armor Corps.” *Small Wars Journal* (17 April 2010): 2. http://smallwarsjournal.com/jrnl/art/the-death-of-the-armor-corps (accessed 25 September 2013).

Global Security. “M-1 Abrams Main Battle Tank.” http://www.globalsecurity.org/military/systems/ground/m1-specs.htm (accessed 5 May 2014).

Gourley, Scott R. “Abrams Dieselization Project: A Modest Proposal. Defense Media Network.” 5 November 2013. http://www.defensemedianetwork.com/stories/abrams-dieselization-project-a-modest-proposal/ (accessed 8 November 2013).

Merriam-Webster Inc. *Merriam-Webster's Collegiate Dictionary*. 2004. http://www.merriam-webster.com/dictionary/tank?show=0&t=1399305632 (accessed 5 April 2014).

Reed, John T. “Is the U.S. Army’s Armor Branch a Fraud?.” http://www.johntreed.com/armor.html (accessed 12 December 2013).